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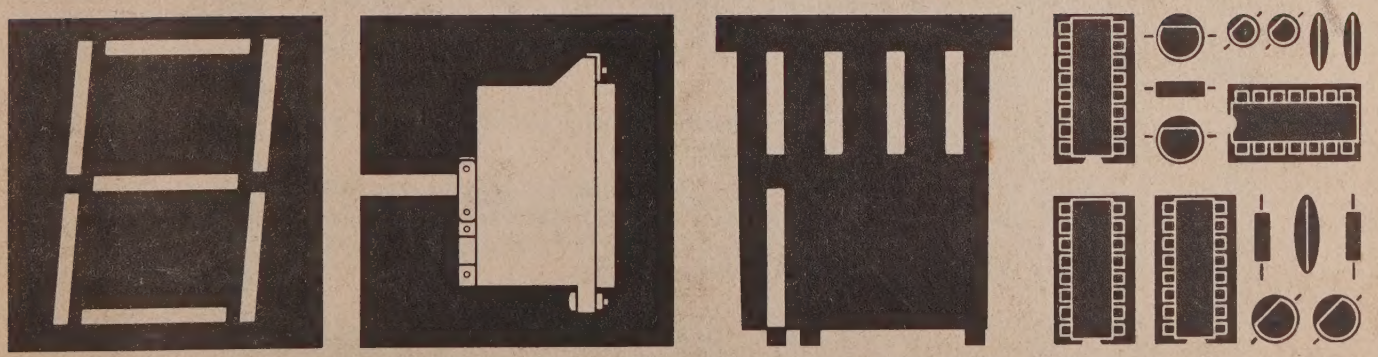
8500 Series
Universal Counter/Timers

MP MASTER
MA36022



Monsanto Instrumentation

WARNING

This instrument is designed to prevent accidental shock to operator when properly used. However, no engineering design can render safe an instrument which is used carelessly. Therefore, this manual must be read carefully and completely prior to making any measurements. Failure to do so can result in a serious or fatal accident.

SHOCK HAZARD (As defined in Underwriters Laboratories Radio and Television Receiving Appliances Standards for Safety, Twelfth Edition, dated June 25, 1969.)

"Shock hazard shall be considered to exist at any part involving a potential of between 42.4 volts peak and 40 kilovolts peak in the following cases:

A. If the current through a load of not less than 500 ohms exceeds 300 milliamperes after 0.0003 second.

B. If the current through a load of not less than 500 ohms exceeds 5 milliamperes after 0.2 second.

C. If the time required for the current through a load of not less than 500 ohms to decrease to 5 milliamperes is between 0.1 and 0.2 second, and the total quantity of electricity passed through the load up to that time exceeds 4 millicoulombs.

D. If the time required for the current through a load of not less than 500 ohms to decrease to 5 milliamperes is between 0.03 and 0.1 second, and the total quantity of electricity passed through the load up to that time exceeds $75T\text{-}350T^2$ millicoulombs, where T is the time in seconds.

E. If the potential is more than 5 kilovolts peak and if the total capacitance of the circuit is more than 3000 micromicrofarads.

NOTE: Additional factors might apply when potentials more than 40 kilovolts peak are present.

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SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

WARRANTY

UNITED SYSTEMS CORPORATION warranties that each instrument and other articles of equipment manufactured by USC to be free from defects in material and workmanship, when subjected to normal use and service. This warranty is expressly limited to the servicing and/or adjusting of USC supplied equipment (i. e. USC is not liable for damage to customer supplied equipment interfaced with USC equipment) returned, freight prepaid, to the factory or to the nearest factory authorized service center within one year from date of delivery; and to the repairing, replacing or adjusting of parts (excepting lamps, fuses, batteries, probes and electro-mechanical assemblies) which upon examination shall be found defective. This warranty shall not apply to any instrument or other article of equipment which has been repaired or altered outside of USC factory or authorized service stations nor which has been subject to misuse, negligence or accident, incorrect wiring by others, or installation of use not in accord with instructions furnished by the manufacturer.

Material on electro-mechanical assemblies is warranted for 1 year from the date of delivery while labor is warranted for 90 days from the same date.

This warranty is expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on its part, and UNITED SYSTEMS CORPORATION neither assumes nor authorizes any other persons to assume for it any other liability in connection with the sale of its products beyond the specifically provided hereinabove.

TABLE OF CONTENTS

8500 SERIES

		page
1.	GENERAL INFORMATION	1
1.1	Unpacking and Inspection	2
1.2	Features	3
1.3	Options and Accessories	3
1.4	Instrument Identification	4
1.5	Technical Characteristics	4
1.6	Precautions	8
2.	OPERATION	9
2.1	Front Panel Controls and Indicators	9
2.2	Rear Panel Controls	12
2.3	Operating Instructions	14
2.4	Initial Familiarization	15
2.5	Detailed Operating Instructions	17

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1. GENERAL INFORMATION 8530

The 8500 Series Universal Counter/Timers are instruments of breeding and refinement. They exhibit all of the qualities inherent to members of instrumentation's first family, the elite HT (High Technology) Series. Intrinsic to the design standard of the HT Series is the highest level of reliability and serviceability. All IC's, LED's, and circuit boards are "plug-in" for quick and easy maintenance.

The 8500 Series provides the full complement of functions including Frequency, Period, Multiple Period Average, Time Interval, Time Interval A to B, Ratio, and Totalize.

A unique "opti-ranging" display is used in all operating modes. Frequency measurements utilize digits of constant weight,(i.e. the unit value of any one decade remains constant) with nonsignificant leading and trailing zeroes blanked, and with no decimal point required. This produces a display that is particularly easy to interpret. In the time and period modes, "Opti-ranging" couples the decimal point and units readout so that no more than three significant digits appear to the left of the decimal point (except when times longer than 1000 seconds are measured), irrespective of the resolution selected.

The 8500 Series also provides an exclusive feature to prevent the display of erratic or erroneous data. With no signal input, or when signal amplitudes are below the AGC level, a zero is displayed in the least significant digit while all other digits are blanked.

The basic instrument of the family, the Model 8510, has a frequency range of 50 MHz.

Models 8520, 8530, and 8540 have an additional high-sensitivity frequency input on the rear panel for measurements to 150MHz, 520MHz and 1GHz respectively.

BCD output options, various mounting options and an external gate input round out the capabilities of this versatile instrument.

1.1 UNPACKING AND INSPECTION

Examine the shipping carton for any sign of damage. If there is any indication of damage, file a complaint with the carrier prior to using the instrument. The shipping carton should contain:

(1) A Model 8510, 8520, 8530, or 8540 instrument

(2) Power Cord

(3) Instruction Manual

If the instrument appears to be in good condition, proceed with the following instructions, making sure to familiarize yourself with power requirements and controls. Refer to the SHOCK HAZARD WARNING on the inside front cover and read those instructions thoroughly to avoid injury due to electrical shock.

Save the shipping carton and packing materials for future storing or shipping of the instrument.

If the instrument must be returned, give a full description of the failure and the mode of operation that was used when the instrument failure occured. Ship in the original carton or otherwise sufficiently packaged to prevent damage in shipment PREPAID to our nearest authorized service center (see inside rear cover).

1.2 THE OUTSTANDING FEATURES OF THIS SERIES ARE:

* 9 digit LED display
* "Opti-Ranging" for optimum display presentation
* Automatic cut-off to prevent erratic or erroneous measurements from marginal input signals.
* 10mV RMS sensitivity with AGC for VHF and UHF measurements
* High stability, oven controlled crystal oscillator
* Optional parallel BCD output
* No overrange ambiguity
* Plug-In IC's, circuit boards, and display
* Instrument Self-Test
* Rugged, but attractive and easily rack mounted case

1.3 OPTIONS and ACCESSORIES

1. Buffered BCD output - featuring single line multiplex enable (used for single unit output or for multiplexing many units). Parallel 8-4-2-1, TTL compatible. Isolation: input to ground 500 VRMS. Option No.011
2. High Stability Crystal - Zero warmup time; aging rate 1 part in 10^6 per year; temperature stability ± 1 part in 10^8 per°C from 0°C to 50°C; line voltage stability ± 1 part in 10^8 for 10% change in line voltage. Option No.062
3. Input "tee", 50 ohm, 8" cable, BNC

   Part No. 88001000
4. Cable, 18", 50 ohm, BNC to BNC

   Part No. 88000020
5. Cable, 48", 50 ohm, BNC to BNC

   Part No. 88000010

6. Rack Mounting is accomplished by Panel Adaptor Kits available from the factory. The Model 8500 Series can be mounted singularly or with other Monsanto/DigiTec instruments into a standard 19 inch (48.26 cm) rack cabinet.

To Rack Mount a 8500 Series Instrument		Panel Adaptor Kit Required
Monsanto	By Itself	742
	With a 3-1/2" high Monsanto Instrument	743
DigiTec	With a 3-1/2" high DigiTec Instrument	746
	With a 5-1/4" high DigiTec Instrument	745

1.4 INSTRUMENT IDENTIFICATION

Instrument model number and serial number are given on a tag on the rear plate.

1.5 TECHNICAL CHARACTERISTICS

FREQUENCY MEASUREMENT

	MODEL			
	8510	8520	8530	8540
FREQUENCY RANGE	5Hz to 5MHz	5Hz to 150MHz	5Hz to 520MHz	5Hz to 1GHz
Input "A"	5Hz to 50MHz (All Models)			
Input "C"	N/A	100Hz to 150MHz	10MHz to 520MHz	50MHz to 1GHz
RESOLUTION; GATE TIME				
MAX	0.1Hz; 10 Sec.	1Hz; 1 sec		
MED	1Hz; 1 sec	10Hz; 100 msec		
MIN	10Hz 100 msec	100Hz; 10 msec		
Accuracy	± count ± time base stability			
Readout	Correctly positioned relative to fixed MHz,KHz, and Hz marks			

PERIOD MEASUREMENT

Display Range	100 sec
Resolution	100ns
Accuracy	± count ± time base stability ± trigger error*
Readout	Automatic ranging with us,ms, or sec resolution and decimal point

PERIOD AVERAGE

100 periods	Display Range	100msec
	Resolution	1nsec
	Accuracy	$\pm$ count $\pm$ time bast stability ± trigger error* / periods averaged
	Readout	Display in milliseconds with decimal point
10,000 periods	Display Range	100nsec
	Resolution	10 pico seconds
	Accuracy	$\pm$ count $\pm$ time base stability $\pm$ trigger error* / periods averaged
	Readout	Display in microseconds with decimal point

TIME INTERVAL

Range; Resolution	
MAX	100 sec (max time displayable without overflow; 100nsec
MED	10^5 sec (3 hours) ; 100µsec
MIN	10^8 sec (1100 days) ; 100msec
Accuracy	$\pm$ count $\pm$ time base stability $\pm$ trigger error (input A to B)* or Gate input**
Readout	Display automatically selects µsec, msec or seconds as required with the appropriate decimal point.

* Less than $\pm$0.3% of one period for sinewaves with signal-to-noise ratio of 40dB or better with signal amplitude equal to 100mV (5Hz to 20Hz) or 50mV (20Hz and above) or greater

** Less than $\pm \frac{0.005\text{nsec}}{\text{signal slope (V/nsec)}}$

RATIO

	8510	8520	8530	8540
Display	F_a/F_b times multiplier of 1, 10^3, or 10^6			
FREQUENCY RANGE	INPUT A (F_a)		INPUT B (F_b)	
Sinewave	5Hz to 50MHz		5Hz to 20MHz	
Pulse	DC to 50MHz		DC to 20MHz	
Accuracy	$\pm$ 1 count $\pm$ $\frac{\text{trigger error of } F_b^*}{\text{multiplier}}$			
Readout	Dimensionless with automatically positioned decimal point			

TOTALIZE

DISPLAY RANGE	1 to 10^9 counts
FREQUENCY RANGE	
Sinewave	5Hz to 50MHz
Pulse	DC to 50MHz
Accuracy	+ 1 count

GENERAL

Sensitivity: Signal levels below the specified unit will blank all digits except the least significant zero, thus preventing the display of erratic or erroneous data.

Input			
A	25mV rms, 100mV peak pulse, 10nsec minimum pulse width		
B	5Hz to 100Hz	100mV rms	
	100Hz to 50MHz	25mV rms	
	100mV peak pulse, 10nsec minimum pulse width		
	Courier Model		
	8520	8530	8540
C	10mV rms	10mV rms 10MHz 512MHz decreasing to 100mV rms @ 520MHz	25mV

Maximum Input		
1 MEG/X1	5Hz to 1KHz	125 Volts rms 500 Volts (DC plus AC peak)
	1KHz to 10MHz	125 Volts rms at 1KHz decreasing to 5V rms at 10MHz
	10MHz to 150MHz	5V rms
1 MEG/X100	5Hz to 50MHz	125V rms 500 Volts (DC plus AC peak)
50 /X1	Courier Model	
	8520	8530	8540
	5Vrms	5Vrms	2Vrms

* Less than $\pm$0.3% of one period for sinewaves with signal-to-noise ratio of 40dB or better with signal amplitude equal to 100mV (5Hz to 20Hz) or 50mV (20Hz and above) or greater.

Input Impedance (AC Coupled)		
Channels A & B	1 Megohm shunted by 30pF	
	Model	
	8520	8530 & 8540
Channel C	1 Megohm shunted by 20PF or 50 ohms nominal	50 ohms nominal
Triggering	Slope: Positive or negative edge trigger	
	Level: Positive going pulse (Symetrical waveshape (zero crossing) Negative going pulse	
Time Base		
	Standard	High Stability Crystal (Option 062)
Aging Rate	3 parts in 10^7 per month	1 part in 10^8 per week
Temperature Stability: (0^0 to 50^0)	$\pm$2.5 parts in 10^6***	$\pm$3 parts in 10^7 ***
Line Voltage Stability:	+ 1 part in 10^7	+1 part in 10^8
Oscillator Output:	10MHz TTL level, Fan out = 10	
External Oscillator Input:	10MHz Nominal; TTL Compatible; Maximum input of 10V P-P	
Operating Temperature:	0^0C to 50^0C	
Power:	115/230 volts $\pm$10% 50 to 400Hz; 35VA	
Dimensions:	3.5"H x 8.5"W x 13.25"D 8.89 cmH x 21.59 cmW x 33.66 cmD	
Weight	Net: 8 lbs 3.63Kg	Shipping: 11 lbs 5Kg

OPTIONS & ACCESSORIES

BCD Output (Option 011)	Buffered, Parallel 8-4-2-1 code, positive true single line enable TTL Level. Fan out = 10 standard TTL loads
High Stability Crystal (Option 062)	Improved aging rate, temperature stability and line voltage stability (See Time Base).
Rack Mounting	Use to mount single instrument in 19" rack.
Part Number 720	Used to mount a single instrument into a 19" rack
Part Number 721	Used to mount two instruments into a 19" rack

1.6 PRECAUTIONS

WARNING

The 8500 SERIES UNIVERSAL COUNTER/TIMERS are designed to be used only by personnel qualified to recognize shock hazards and trained in the safety precautions required to avoid possible injury. Refer to SHOCK HAZARD WARNING inside front cover.

Make certain that the proper power fuse, F1, on the rear panel, is being used.

Line Voltage	Fuse Size	Littel Fuse P/N
105 - 125VAC	1/2 A	213.500
210 - 250VAC	1/4 A	213.250

The CLOCK switch (on the rear panel) should be in the INT. position except for two special cases:

1) Operating in the TIME INTERVAL or GATED TOTALIZE mode. (See section 2.5.5 or 2.5.7.)
2) Operating in conjunction with an external clock. (See section 2.2, GATE/CLOCK switch.)

WARNING

1. Do not use a 3 wire to 2 wire line cord adapter plug is a properly grounded (latest electrical code), 3 wire power receptacle is available.
2. If the power receptacle is a 2 wire type, and provides a ground connection at the receptacle plate retaining screw, a 3 wire to 2 wire adapter can be used but the ground lead of the adapter must be firmly and electrically connected to the plate retaining screw.
3. If the power receptacle is a 2 wire type and does not provide a ground connection at the receptacle plate retaining screw, a separate grounding lead must be connected from the ground lead of the adapter to a good earth ground (cold water pipe, etc.).

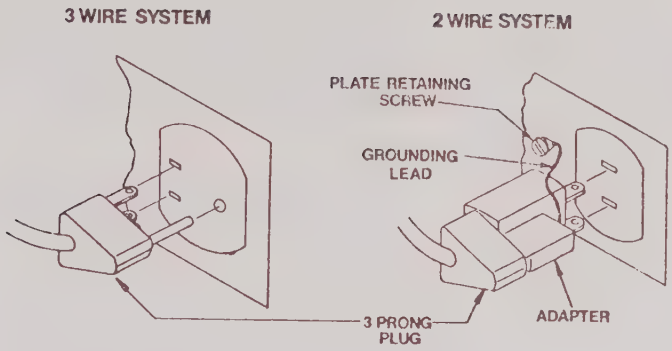
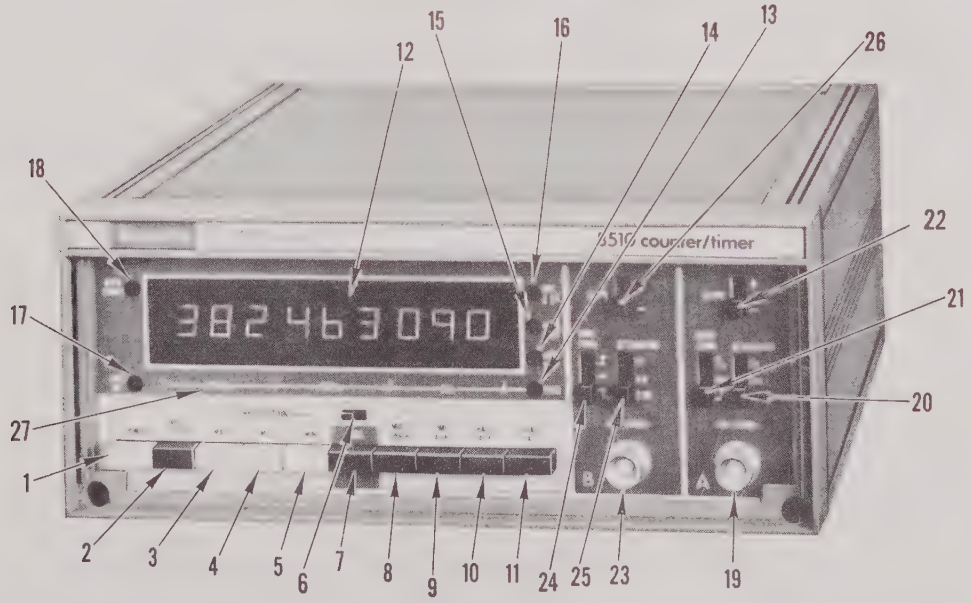


Figure 1
Connection to AC Power

2. OPERATION

2.1 FRONT PANEL CONTROLS AND INDICATORS



(1) POWER (button) — Push-on, push-off switch. Applies AC power to the instrument.

(2) RESET (button) — Momentary pushbutton. When depressed, resets instrument and causes all digits to display 8's (lamp test). Normal operation resumes when released.

(3) MAX (imum) (button) — When depressed, causes the highest resolution to be selected - i.e. maximum number of digits. (In PERIOD mode, selects 10^4 periods)

(4) MED (ium) (button)

When depressed, chooses a resolution intermediate between that chosen by MAX and that chosen by MIN. (In PERIOD mode, selects 10^2 periods.)

(5) MIN (imum) (button)

When depressed chooses the lowest available resolution - i.e. minimum number of digits displayed. (In PERIOD mode, selects 1 period.)

(6) A/C switch (8520, 8530 & 9540 only)

Two position slide switch: Channel A- used in all cases where input is via the front panel "Channel A" BNC connector (Frequencies up to 50MHz).
Channel C - Used when input is via rear panel "Channel C" BNC connector (Frequencies above 50MHz.)

(7) FREQ (button)

Selects the FREQUENCY mode of operation. This is indicated by the illumination of the FREQ indicator (13).

(8) MULTI PER B (button)

Selects either the PERIOD or MULTIPLE PERIOD mode of operation

* If MULTI PER B is engaged and MIN resolution is selected, the instrument will operate in the PERIOD mode.
* If MULTI PER B is engaged and MED resolution is selected, the instrument will operate in the MULTIPLE PERIOD mode and will measure the average of 100 successive periods.
* If MULTI PER B is engaged and MAX resolution is selected, the instrument will operate in the MULTIPLE PERIOD mode and will measure the average of 10,000 successive periods.

(9) TIME A-B (button)

Selects either the TIME A-B or the TIME INTERVAL mode of operation.
* If TIME A-B is engaged and the input signal is applied to the CLOCK on the rear panel, the instrument will operate in TIME INTERVAL mode.
* If TIME A-B is engaged and input signals are applied to inputs A and B, the instrument will operate in the TIME A-B mode.

(10) RATIO A÷B

Selects the FREQUENCY RATIO mode of operation

(11) TOTAL A (button)

Selects either the TOTALIZE or GATED TOTALIZE mode of operation.
* If TOTAL A button is depressed and an input signal is applied to input A, the instrument will operate in the TOTALIZE mode.

* If TOTAL A button is depressed and an input signal is applied to input A while a GATE signal is applied to CLOCK (rear panel), GATED TOTALIZE is produced.

(12) NUMERIC DISPLAY — Nine digit, 7-segment LED "Opti-Ranging" display which presents data in the format most readily understood.

(13) FREQ (indicator) — LED indicator, illuminates when the instrument is in the FREQUENCY mode.

(14) μSEC x1 (indicator) — Dual purpose LED indicator, illuminates when the unit of time measurement is microseconds or when the multiplier in a FREQUENCY RATIO measurement is 1.

(15) mSEC $x10^3$ (indicator) — Dual purpose LED indicator, illuminates when the unit of time measurement is milliseconds or when the multiplier in a FREQUENCY RATIO measurement is 10^3.

(16) SEC $x10^6$ (indicator) — Dual purpose LED indicator, illuminates when the unit of time measurement is seconds or when the multiplier in a FREQUENCY RATIO measurement is 10^6.

(17) GATE (indicator) — LED indicator, illuminates while count is occurring.

(18) OVERRANGE (indicator) — LED indicator, illuminates when the capacity of the display is exceeded.

(19) A input — BNC connector. Accepts the A input signal

(20) B input — BNC connector. Accepts the B input signal

(21) ATTENUATOR (A)
(22) ATTENUATOR (B)

3-position slide switch.

x1: amplitude unchanged
x10: amplitude attenuated by a factor of 10
x100: amplitude attenuated by a factor of 100

(23) WAVEFORM (A)
(24) WAVEFORM (B)

3-position slide switch. Select, from the following, the appropriate waveform for A and/or B inputs.

⎍ positive pulse or pulse train
∿ sine or other symmetric waveform
⎎ negative pulse or pulse train

(25) SLOPE (A)

2-position slide switch. (Used in Time A-B only).
+ position: Time A-B measurement is initiated by the rise of the signal at Input A.
- position: Time A-B measurement is initiated by the fall of the signal at Input B.
If any mode other than Time A-B the position of this switch is arbitrary.

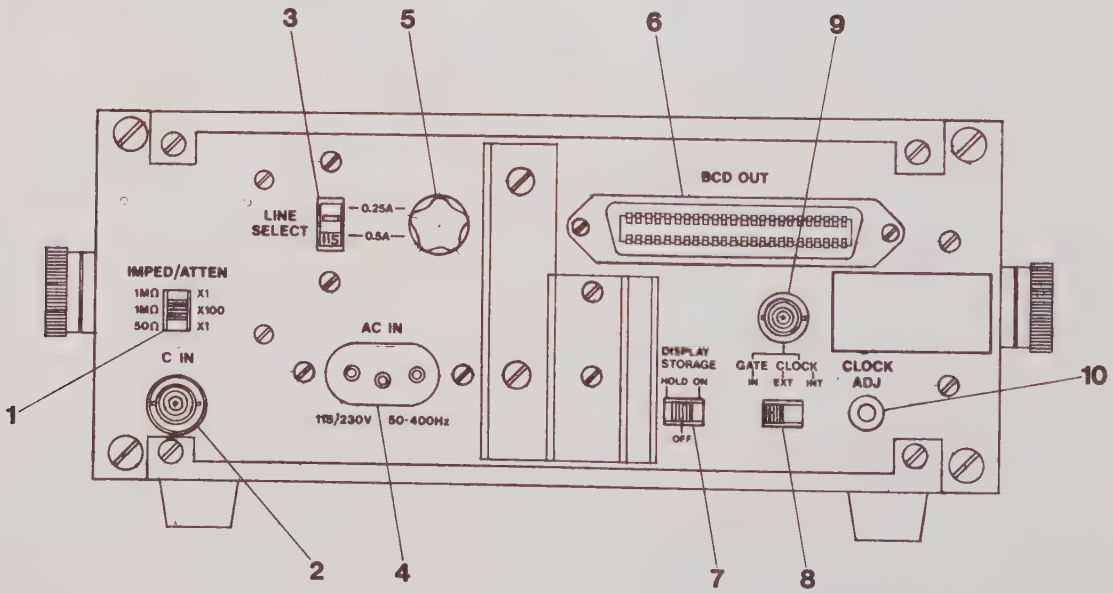
(26) SLOPE (B)

2-position slide switch. (Used in Time A-B only)
+ position: Time A-B measurement, once started, is stopped by the next occurring rise of the signal at Input B.
- position: Time A-B measurement, once started, is stopped by the next occurring fall of the signal at Input B.
If any mode other than Time A-B, the position of this switch is arbitrary.

(27) FREQUENCY MARKINGS

Indicate which digits represent MHz, KHz, or Hz, in the FREQUENCY mode only.

2.2 REAR PANEL CONTROLS



(1) IMPEDANCE SELECTOR

3-position slide switch (Model 8520 only)
50Ω/x1 - Input impedance is 50 ohms
1MEG/x100 - Input impedance is 1 megohm: 40db attenuation
1MEG/x1 - Input impedance is 1 megohm: no attenuation

(2) INPUT C

BNC connector. Accepts C input signal (Model 8520,8530, 8540 only).

(3) 115V/230V

2-position slide switch (screwdriver required). This switch allows the instrument to be operated with either 115V or with 230V power.

(4) AC RECEPTACLE

Accepts AC line cord.

(5) FUSEHOLDER

For 230V use: 1/4A, (Littelfuse, 213.250)
For 115V use: 1/2A, (Littelfuse, 213.500)

(6) BCD Out
(BCD option only)

50-pin connector. BCD outputs and control signals appear at this connector. Allows for data recording with DigiTec 6100 Series Digital Recorders mode/691 Printer, or other recording device.

(7) DISPLAY STORAGE

3-position slide switch
ON: A measurement is stored and displayed until a subsequent measurement, initiated after a 50msec delay, is completed. The display will then update to the new reading. Measurements taken within the 50msec delay period are ignored.
OFF: Display shows the current state of the counters, that is, shows count in progress. This position has a fixed delay of 2.5 sec from the completion of a measurement until a subsequent measurement is initiated.

HOLD: Automatic reset is inhibited. A measurement, once completed, is displayed until manually reset. Makes possible one-shot measurements.

(8) GATE/CLOCK
(switch)

3-position slide switch
INT(ernal): Instrument operates on its internal 10MHz clock. This clock signal is available at CLOCK BNC connector (9).
EXT(ernal): Instrument operates on an external TTL compatible, 10MHz clock connected to GATE/CLOCK (9).
GATE IN: Instrument operates on its internal 10MHz clock but the count (gate time) is controlled

(8) continued — by a gate signal introduced to GATE/CLOCK (9). The internal 10MHz clock signal is not available as an output at CLOCK(9)

(9) GATE/CLOCK — Multi-purpose clock and gate connector. When the GATE/CLOCK switch (8) is in the INT. position, an output signal of the internal 10MHz clock is provided at this connector. When the GATE/CLOCK Switch is in the EXT. position, an external 10MHz clock may be connected to this BNC connector. When the GATE/CLOCK switch is in the GATE position, an external gate signal may be presented at this connector.

(10) CLOCK ADJ. — Adjustment for the internal 10MHz clock.

2.3 OPERATING INSTRUCTIONS

2.3.1 ATTENUATION

The ATTENUATOR switches should be positioned for maximum attenuation while allowing sufficient input to produce a reliable count. If the input amplitude is known, the following guideline may be used:

sinewave:	X1: Up to 3V peak-peak, 1V rms
	X10: 3V to 30V peak-peak, 1-10V rms
	X100: greater than 30V peak-peak, greater than 10V rms
pulses:	X1: up to 2V
	X10: 2V to 20V
	X100: greater than 20V

If the input amplitude is not known, the follwoing procedure should be used.

1. Set the ATTENUATOR switch to X100 BEFORE connecting the input signal.
2. Connect the input signal and determine if the amplitude is sufficient to produce a count. When the signal is connected to input A, sufficient input may be determined by depressing FREQ. and observing if the display is reading the frequency of a known input. When the signal is connected to input B, sufficient amplitude can be

determined by depressing MULTI PER B and observing if the GATE indicator is flashing.

3. If the input is sufficient, leave the switch at the X100 position. If the input is insufficient, advance the switch to the X10 position and determine, using steps 1 and 2, if the resulting amplitude is sufficient. If not, advance the switch to the X1 position.

NOTE

It is advisable to depress RESET immediately after changing either a front panel mode button (7) thru (11)or a resolution button (3) thru (5). An exception to this is the TOTAL A button. Do NOT follow this by depressing RESET unless it is desired to reset the counter to zero. (See Section 2.5.7 or 2.5.8).

2.4 INITIAL FAMILIARIZATION

The user, to acquaint himself with the instrument and to assure that it is operative, should perform the following procedure:

(1) Determine that the 115/230 VAC switch is in the correct position and that the proper fuse is in place.

(2) Connect line cord and depress POWER switch

(3) Mode: Depress FREQ

Resolution: Depress MIN

A/C switch (Models 8520,8530,8540): Channel A

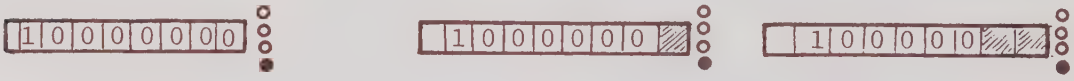
(4) Depress and hold RESET button. All 8's should illuminate on the display. Upon release of the RESET BUTTON, there will be one zero (0) in the least significant position.

(5) Observe the GATE indicator. It will be flashing about twice a

second. Depress the MED resolution button. The recurrence rate will be slightly lower. Push MAX resolution. The recurrence will now be about once in 2.5 sec.

(6) An operational test of the FREQ mode can be performed by setting the ATTENUATOR switch (Input A) to X1 and connecting a co-ax cable from CLOCK (9) on the rear panel to Input A on the front panel.

(7) With MAX resolution selected, the display will be as shown in figure 4, view A (plus or minus one digit). Select MED resolution and observe that the display is as shown in figure 4, view B (again plus or minus one count). Select MIN resolution. The display will now be as shown in figure 4, view C. It is significant to note, as unique features of "Opti-Ranging", that although the resolution is different in each example, the weights of the digits remain constant, the number of low order digits displayed is decreased, and the gate time is reduced proportionately.



View A View B View C

Figure 4

(8) Select MAX resolution and change the DISPLAY switch on the rear panel form STORAGE ON to STORAGE OFF. The display will count upward for 1 second, display 10,000,000 for about 2 seconds and then repeat.

(9) To conduct an operational test of MULTI PER B, set the controls as follows:

Mode: MULTI PER B

Resolution: MAX

Attenuation: X1

Transfer the co-ax cable from Input A to Input B (Leave the other end connected to CLOCK on rear panel). In this set-up the display will be as shown in figure 5 view A. Select MED resolution and observe that the display is as shown in figure 5 view B. Depress MIN resolution and the display will be as shown in figure 5 view C. (In all cases the display may be plus or minus one count).

View A View B View C

Figure 5

Views A, B, and C all display 0.1µsec, but with different resolution in each case.

2.5 DETAILED OPERATING INSTRUCTION

2.5.1 FREQUENCY

The frequency mode measures the average frequency of a signal at input A over a selected gate time. A shorter gate time reduces the number of significant digits displayed, but allows readings to be updated more rapidly.

PROCEDURE FOR FREQUENCY MEASUREMENTS

Set controls as follows:

Mode: FREQ

Resolution: MAX

Display switch: STORAGE ON

Clock switch: INT

A/C switch (Models 8520, 8530, 8540): A

Waveform switch (Input A): ⊓ for positive pulse
~ for sine or ther symmetric wavefore
⊔ for negative pulse

Slope switch (Input A): NOT APPLICABLE

Attenuator switch (Input A): See OPERATING INSTRUCTION, ATTENUATOR (Section 2,3.1.1)

Procedure: Connect signal to Input A. Fifty ohm sources should, if possible, be connected using a 50 ohm feed-through termination. If less resolution is desired, depress MED or MIN. Less resolution is indicated if more frequent measurements are desired, or if an unstable source causes dither in the least significant digit.

DISPLAY

* The FREQ indicator will be illuminated
* No decimal point will appear
* Units will be indicated by frequency marking below the numerals.

TIME BASES AND RESOLUTION

* If MAX resolution is selected, all low-order digits will be displayed. On the Model 8510 this will produce a resolution of 0.1Hz and a gate time of 10 seconds. For Models 8520, 8530 and 8540, MAX will produce 1Hz resolution and a 1 second gate time.
* If MED resolution is selected, the right-most (least significant) digit will be blank. On the Model 8510 this will produce a resolution of 1Hz and a gate time of 1 second. For Models 8520, 8530 and 8540, MED will produce 10Hz resolution and a 100msec gate time.
* If MIN resolution is selected, the two right most (Least significant) digits will be blanked. On the Model 8510 this will produce a resolution of 10Hz and a gate time of 100msec. For Models 8520, 8530 and 8540, MIN will produce 100Hz resolution and a 10msec gate time.

Selected on front panel		MAX	MED	MIN
Model 8510	Resolution	0.1Hz	1Hz	10Hz
	Gate Time	10sec	1sec	100msec
Models 8520 8530 8540	Resolution	1Hz	10Hz	100Hz
	Gate Time	1sec	100msec	10msec

NOTE: If the frequency to be measured is very low, no reading may appear if the RESOLUTION is MED or MIN. (for example, with MIN selected, the lowest frequency displayable on Model 8510 is 10Hz and on Models 8520, 8530 or 8540; 100Hz is the lowest displayable frequency).

2.5.2 PERIOD

The period mode measures the duration of a single period of a signal applied to Input B.

PROCEDURE FOR PERIOD MEASUREMENTS

Set controls as follows:

Mode: MULTI PER B

Resolution: MIN

Display switch: STORAGE ON

Clock switch: INT

A/C switch (Models 8520, 8530 and 8540): A

Waveform switch (Input B): ⎍ for positive pulse
∿ for sine or other symmetric waveforms
⎎ for negative pulse

Slope switch (Input B): NOT APPLICABLE

Attenuator switch (Input B): See OPERATING INSTRUCTION, ATTENUATOR (Section 2.3.1.1)

Procedure: Connect signal to input B. Fifty ohm sources should, if possible be connected using a 50 ohm feed-through termination.

Maximum frequency is 10MHz.

DISPLAY

The decimal point, located automatically by "opti-ranging", is coupled with the unit's designation to provide optimum readability. Units, second, milliseconds or microseconds, will be indicated by illumination of a lamp at the right edge of the display.

RESOLUTION

The resolution of all measurements taken in this mode is 0.1 μseconds (100 nanoseconds).

2.5.3 MULTIPLE PERIOD AVERAGE

The multiple period average mode measures the average of either 100 or 10,000 (selected on front panel) successive periods of a signal applied to input B. Taking the average of a large number of periods both increases resolution and decreases effect of trigger-error, these at the expense of increased delay between successive measurements.

PROCEDURE FOR MULTIPLE PERIOD AVERAGE MEASUREMENTS

Set controls as follows:

Mode: MULTI PER B

Resolution: a) For average of 100 periods: Push MED. Maximum time displayable without overflow 100msec (i.e. 10Hz minimum frequency)

b) For average of 10,000 periods: Push MAX. Maximum time displayable without overflow is 100μsec (i.e. 10KHz minimum frequency).

Display switch: STORAGE ON

Clock switch: INT

A/C switch (Models 8520, 8530, 8540): A

Waveform switch (Input B): for positive pulse
for sine or other symmetric waveform
for negative pulse

Slope switch (Input B): Not applicable

Attenuator switch (Input B): See OPERATING INSTRUCTIONS, GENERAL (Section 2.3.1.1)

Procedure: Connect signal to Input B. Fifty ohm sources should, if possible, be connected using a 50 ohm feed-through termination. (MAX. frequency is 10MHz)

If in taking the measurement, the display overflows (see figure 6, view c),select less resolution; that is, change from MAX to MED, or from MED to MIN to display the most significant digit. The most significant digits, however, may be allowed to overflow without affecting the correct display of the least significant digits. This means that more resolution may be obtained at the expense of the most significant digit. It is important to remember the effect of the different resolutions in this mode. MAX resolution results in a measurement of 10,000 successive periods, MED results in a measurement of 100 successive periods, and MIN measures a single period.

DISPLAY

The decimal point, located automatically by "Opti-ranging" is coupled with the units designation to provide optimum readability. Units, Seconds, microseconds, or milliseconds, will be indicated by illumination of a lamp at the right edge of the display.

RESOLUTION

MED: Measures average of 100 successive periods. 1 nanosecond resolution. Right most digit is blanked.

MAX: Measures average of 10,000 successive periods. 10 picosecond resolution. Two right most digits are blanked.

As an example, see figure 6 which shows how a 2KHz (500μsec period) signal would be displayed in single and multiple period modes. Note that with MAX resolution (figure 6, view C), overflow occurs.

View A

Single-Period Mode
(MIN resolution)

View B

Multi-Period Mode
(MED resolution)

View C

Multi-Period Mode
(MAX resolution)

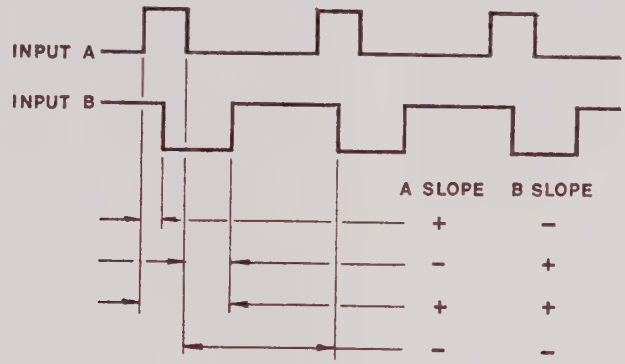
Figure 6

If the frequency is very low, the result may be either overflow, a long waiting time, or both. For example, MED resolution at 5Hz requires 20 seconds to complete the measurement. For such signals it is advisable to begin in the period mode (MIN resolution), and operate with the DISPLAY switch in the DISPLAY STORAGE-OFF position. This will permit the user to know when the measurement is in progress.

2.5.4 TIME A-B

Time A-B measures the elapsed time between two events. Measurement is started by the rise or fall of the signal at input A (as chosen by SLOPE switch A) and stopped by the next occurring rise or fall of the signal at input B (as chosen by SLOPE switch B). Depending on the

positions of the "A" SLOPE switch and "B" SLOPE switch, the following four measurements may be made:



PROCEDURE FOR TIME A-B

Figure 7

Set controls as follows:

Mode: TIME A-B

Resolution: Choose as desired

Display switch: STORAGE ON

Clock switch: INT

A/C switch (Models 8520, 8530, 8540): A

Waveform switch (Inputs A&B): ⎍ for positive pulse
⎍ for negative pulse

Slope switch (Input A): Set to "+" if the measurement is to begin on the rise of the A Input
Set to "-" if the measurement is to begin on the fall of the A Input

Slope switch (Input B): Set to "+" if the measurement is to end on the rise of the B Input
Set to "-" if the measurement is to end on the fall of the B Input.

Attenuator switch (Input A & B): See OPERATING INSTRUCTIONS, GENERAL (Section 2.3.1.1)

Procedure: Connect "A" signal to input A and "B" signal to Input B.

Fifty ohm sources should, if possible, be connected using a 50 ohm feed-through termination.

DISPLAY

The decimal point, located automatically by the "opti-ranging" is coupled with the units designation to provide optimum readability. Units, seconds, milliseconds, or microseconds, will be indicated by illumination of a lamp at the right edge of the display.

RESOLUTION

MAX: 100nsec resolution; maximum time displayable without overflow 100 sec.

MED: 100μsec resolution; maximum time displayable without overflow 10^5 sec (3 hours)

MIN: 100msec resolution; maximum time displayable without overflow 10^8 sec (1100 days)

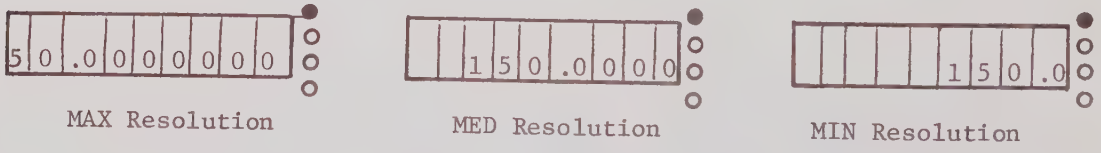
Figure 8 shows how a measurement of 1msec would appear for different resolution choices. Observe that with MIN resolution selected, no significant figure would appear.

MAX Resolution MED Resolution MIN Resolution

Figure 8

A second example, figure 9, shows how in a measurement of 150 seconds with MAX resolution selected, overflow occurs.

● Overflow



MAX Resolution MED Resolution MIN Resolution

Figure 9

2.5.4.1 PULSE WIDTH MEASUREMENT

Pulse width measurement is a special case of TIME A-B measurement

Set controls as follows:

Mode: TIME A-B

Resolution: As appropriate, MAX-100nsec, MED-100µsec, and MIN-100msec

Display switch: STORAGE ON

Clock switch: INT

A/C switch (Models 8520, 8530, 8540): A

Waveform switch (Inputs A&B): ⎍ for positive pulse
⎍ for negative pulse

Slope switch (Input A): + for positive pulse
- for negative pulse

Slope switch (Input B): position opposite to that of Slope A

Attenuator switch (Inputs A & B): See OPERATING INSTRUCTION, ATTENUATOR (Section 2.3.1.1)

Procedure: Connect the signal to both Input A and Input B as shown in Figure 10. Fifty ohm sources should, if possible, be connected using a 50 ohm feed-through termination.

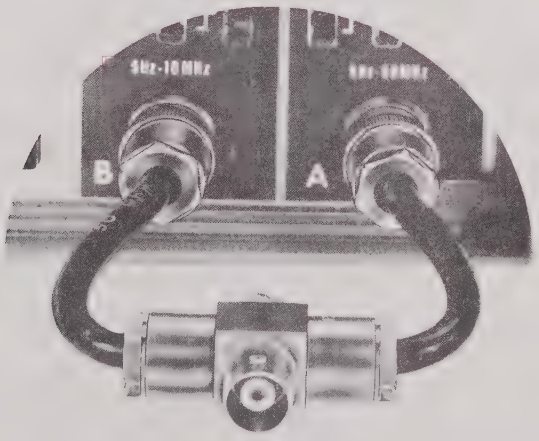


Figure 10

5050 "Tee" BNC Connector, p/n 880010000

2.5.5 TIME INTERVAL

The time interval mode measures the elapsed time from logic 0 to logic 1 of the gate input. The DISPLAY switch may be positioned either to cause automatic reset at the end of a measurement or to allow the result to be displayed and retained indefinitely.

PROCEDURE FOR TIME INTERVAL MEASUREMENTS

Set controls as follows:

Mode: TIME A-B

Resolution: Choose as desired:

MAX: 100 nsec resolution: maximum time displayable 100 secs

MED: 100 μsec resolution: maximum time displayable 10^5 sec (3 hours

MIN: 100 msec resolution· maximum time displayable 10^8 sec (1100 da

Display switch:

a) HOLD: Count is displayed in real time and result of the measurement will be held until manually reset. Repeated pulses on the gate line will be accumulated.

Any contact bounce on the gate signal will be integrated producing an input signal count from the end of the integration period until the gate signal returns to logic "1".

b) STORAGE ON: Result will be displayed as soon as the GATE signal goes high and will be retained until either reset manually or until a second GATE signal has been completed. To operate in this position, the time between the end of a GATE signal and the initiation of a subsequent signal must be at least 0.5 second.

c) STORAGE OFF: Count is displayed in real time, result of the measurement will be held for 2.5 seconds, then automatically reset to zero. To operate in this position, the time between the end of a GATE signal and the initiation of a subsequent signal must be at least 2.5 seconds.

Clock switch: GATE

A/C switch (Models 8520, 8530 6 8540): NOT APPLICABLE

Waveform: NOT APPLICABLE

Slope: NOT APPLICABLE

Attenuator: NOT APPLICABLE

Procedure: Depress RESET. The display should be cleared and the GATE indicator should be off; then apply the signal to the CLOCK BNC connector on the rear panel.

DISPLAY

The decimal point, located automatically by "opti-ranging" is coupled with the units designation to provide optimum readability. Units, seconds, milliseconds, or microseconds, will be indicated by illumination of a lamp at the right edge of the display.

RESOLUTION

Resolution will be as selected.

MAX: 100 nsec resolution; maximum time displayable 100 secs.

MED: 100 μsec resolution: maximum time displayable 10^5 secs (3 hours)

MIN: 100 msec resolution; maximum time displayable 10^8 secs (1100 days)

2.5.6 FREQUENCY RATIO

In the Frequency Ratio Mode, the ratio F_a/F_b (Frequency of a signal applied to input A ÷ frequency of signal applied to input B) is measured and displayed.

PROCEDURE FOR FREQUENCY RATIO MEASUREMENTS

Set controls as follows:

Mode: RATIO A÷B

Resolution: Choose as desired. It is advisable to select MIN for an unknown ratio

Display switch: STORAGE ON

Clock switch: INT.

A/C switch (Models 8520, 8530, 8540): A

Waveform switch (Input A&B): ⎍ for positive pulse
~ for sine or other symmetric waveform
⎎ for negative slope

Slope switch (Input A&B): NOT APPLICABLE

Attenuator switch (Input A&B): See OPERATING INSTRUCTIONS, ATTENUATOR (Section 2.3.1)

Procedure: Connect "A" signal to input A and "B" signal to Input B.

DISPLAY

The display will be a "pure" number, that is, without units designation, and will have a decimal point located by "opti-ranging". One of three indicators adjacent to the right edge of the display window will be illuminated to indicate a multiplier of 1, 10^3, or 10^6.

NOTE

The right most displayed digit will always be 0. It is NOT significant.

Figure 10 illustrates the display of the ratio F_a/F_b = 100 for each choice of resolution. Note that with MAX resolution there is OVERFLOW. The multiplier in each case is 1.

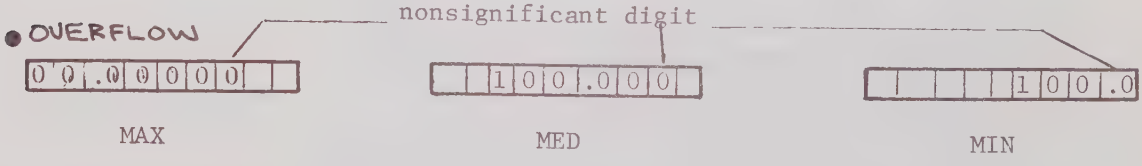


Figure 11

To emphasize that the right most digit is not significant, a second example, figure 12, is illustrated. Given that the frequency ratio

is 15.3, the display, with MED resolution selected, would be as seen in figure 12, view A. With MIN resolution the display would be as seen in figure 12, view B. The 0 is NOT significant. Not to realize this could lead to an erroneous interpretation of the display.

MED Resolution
View A
Four significant digits

MIN Resolution
View B
Two significant digits

Figure 12

2.5.7 TOTALIZE

The totalize mode counts the events (pulses or zero-crossings) occurring in a signal applied to Input A during a time period controlled by a front panel pushbutton (Total A). At user's discretion, operation may be repeated, adding to any previously accumulated total.

PROCEDURE FOR TOTALIZE MEASUREMENTS

Set controls as follows:

Mode: TOTAL A

Resolution: NOT APPLICABLE

Display switch: NOT APPLICABLE

Clock switch: INT

A/C switch: A

Waveform switch (Input A): ⎍ for positive pulse
∿ for sine or other symmetric waveform
⎎ for negative pulse

Slope switch (Input A): NOT APPLICABLE

Attenuator switch (Input A): If input amplitude is known, set as follows:

Sinewave:	x1:	up to 10v peak-peak
	x10:	10v to 100v peak-peak
	x100:	greater than 100v peak-peak
pulses:	x1:	up to 2V
	x10;	2V to 20V
	x100:	greater than 20V

If input amplitude is not known, set ATTENUATOR at x100 and determine if the amplitude is sufficient to produce a count. If the input is insufficient, advance to x10 or x1 until count can be produced.

Procedure:

Connect signal to input A and depress the TOTAL A button, making certain that the GATE indicator is illuminated. Count will now be produced. Counting can be stopped by depressing "RESET/L. TEST" or by depressing TOTAL A a second time. Depressing "RESET/L. TEST" will clear the counters and display while depressing TOTAL A, when count is in progress, will stop the count and display the accumulated total indefinitely. If TOTAL A is depressed a third time, count will resume, adding to any previously accumulated total. Depressing TOTAL A again will stop count, etc.

DISPLAY

As this mode is a "count" function, the display will be a whole number, decimal point will be blanked, and no units will be designated.

2.5.8 GATE TOTALIZE

In the Gated Totalize Mode counts the events (pulses or zero-crossings) occurring in a signal applied to input A during the time a gate signal,

applied at rear, is at logic 0. As with TOTALIZE (Section 2.5.7) the operation may, at the user's discretion, be repeated adding to any previously accumulated total.

PROCEDURE FOR GATED TOTALIZE MEASUREMENTS

Set controls as follows:

Mode: TOTAL A

Resolution: NOT APPLICABLE

Display switch: NOT APPLICABLE

Clock switch: GATE

A/C switch (Models 8520, 8530, 8540): A

Waveform switch (Input A): ⎍ for positive pulse
∿ for sine or other symmetric waveform
⎎ for negative pulse

Slope switch (Input A): NOT APPLICABLE

Attenuator switch (Input A): If amplitude is known, set as follows:

Sinewave:	x1:	up to 10V peak-peak
	x10:	10V to 100V peak-peak
	x100:	greater than 100V peak-peak
Pulse:	x1:	up to 2V
	x10:	2V to 20V
	x100:	greater than 20V

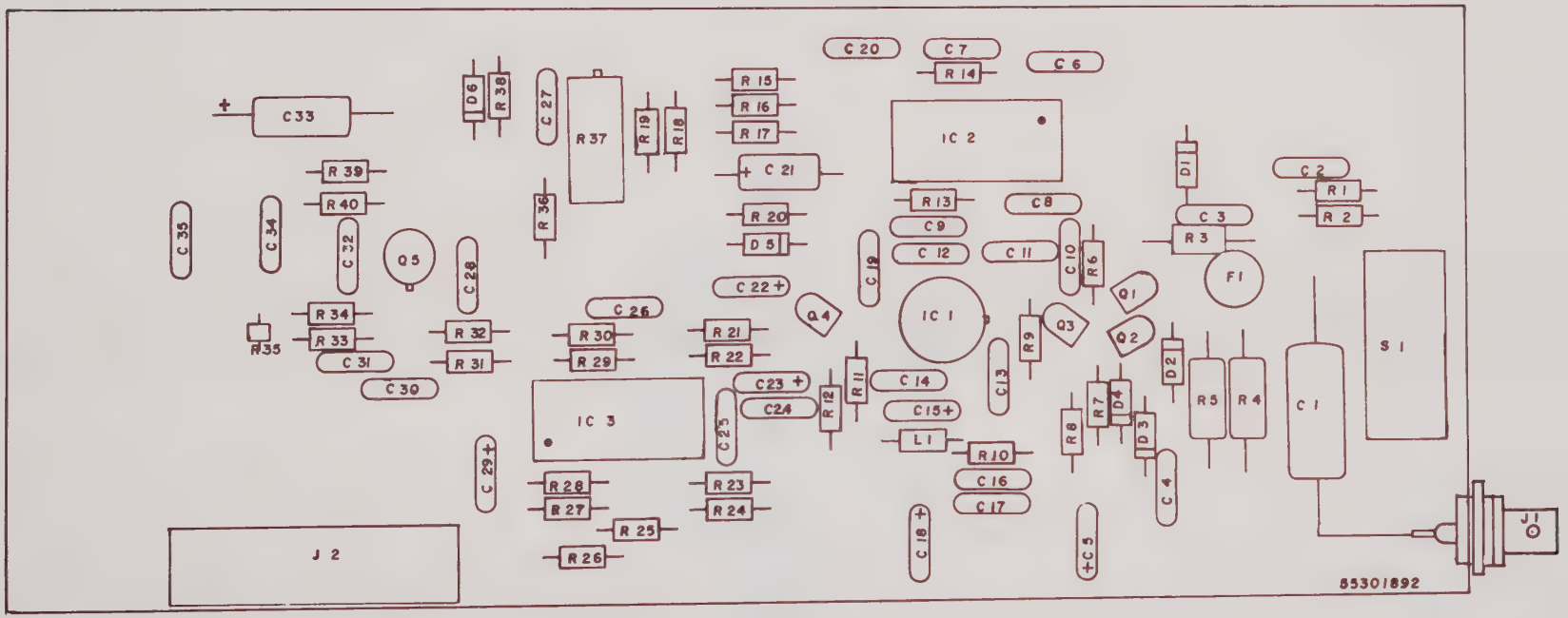
If input amplitude is not known, set ATTENUATOR at x100 and determine if the signal is sufficient to produce a count. If the input is insufficient, advance to x10 or x1 until count can be produced.

Procedure

Connect the signal to be counted to input A and determine that the GATE indicator is off and the display is cleared. Connect the GATE signal to the CLOCK BNC connector on the rear panel. Counting will begin when this GATE signal (normally at logic 1) goes to logic 0 and

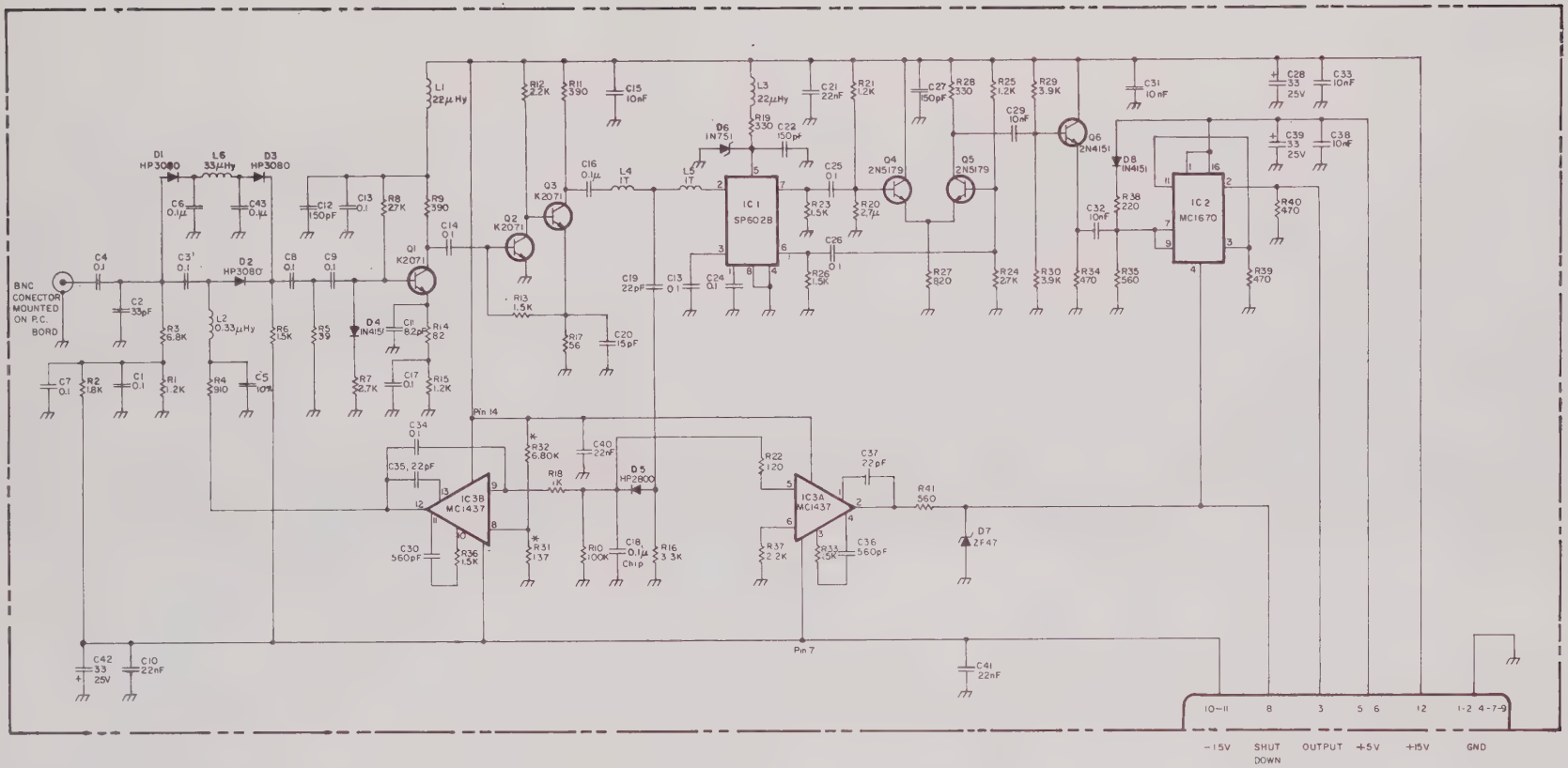
stops when it returns to logic 1. If the GATE SIGNAL is again brought to logic 0, counting resumes, adding to any previously accumulated result. The accumulated total is displayed until reset from the front panel.

SCHEMATICS
AND
COMPONENT LOCATION
DRAWINGS



150. MHz INPUT BOARD

8520/8720



NOTES

1. UNLESS OTHERWISE SPECIFIED ALL RESISTANCES ARE IN OHMS, ALL CAPACITANCES ARE MICRO FARADS.
2. UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE 1/4W, 5% CARBON.
3. RESISTORS MARKED WITH * ARE 1% METAL OXIDE RESISTORS.

HIGHEST DESIGNATION USED					
IC3	Q6	D8	R41	C43	L6

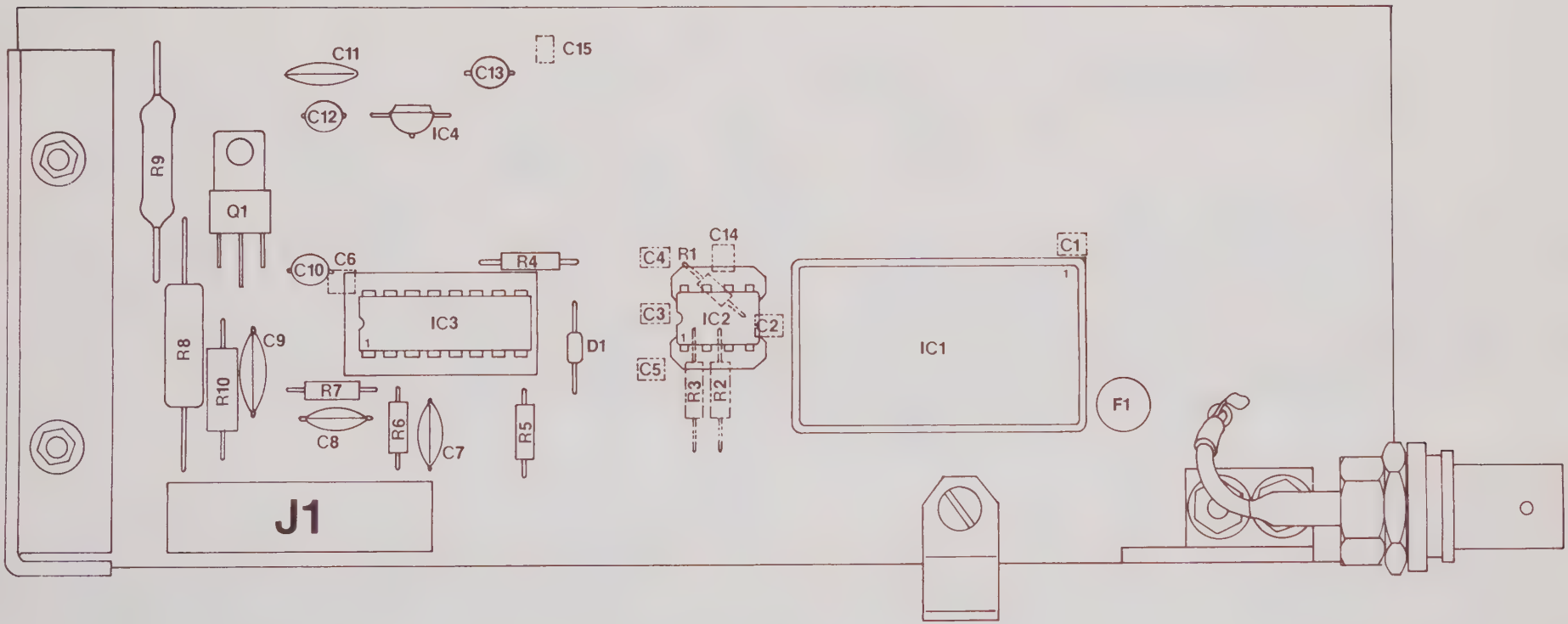
		DATE	SIGN
Material			
	Drawn	4 3 74	REN-HUR
Finish	Eng		
	Apprv.	5 9 74	
Scale	MODEL		

Monsel ELECTRONIC INSTRUMENTS LTD.

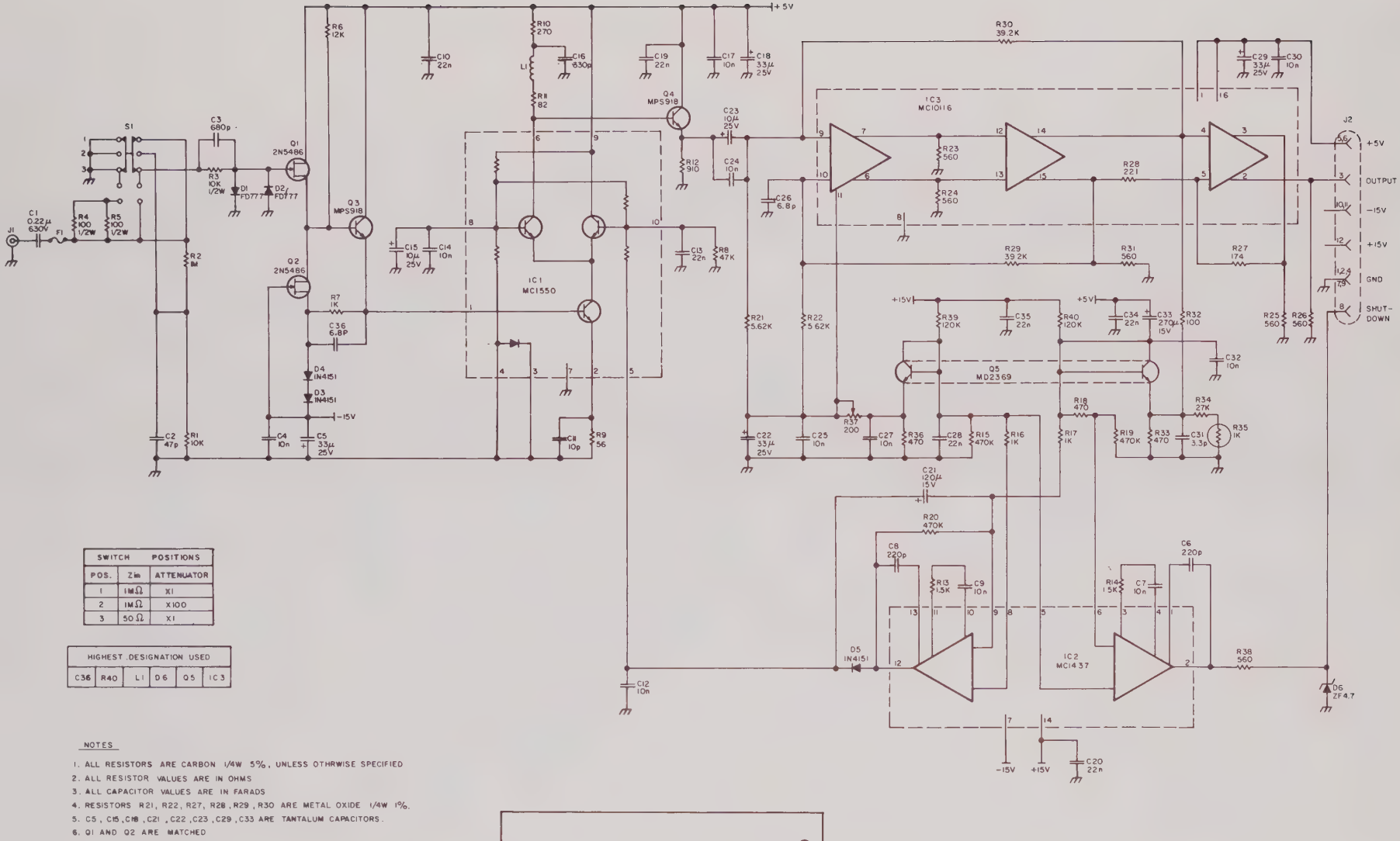
TITLE 500MHz INPUT BOARD

SH 1 of 1

92301222



I GHz INPUT BOARD, COMPONENT LOCATION

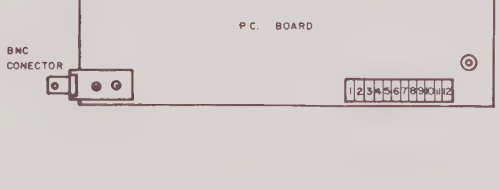


SWITCH POSITIONS		
POS.	Zin	ATTENUATOR
1	1MΩ	X1
2	1MΩ	X100
3	50Ω	X1

HIGHEST DESIGNATION USED					
C36	R40	L1	D6	Q5	IC3

NOTES

1. ALL RESISTORS ARE CARBON 1/4W 5%, UNLESS OTHRWISE SPECIFIED
2. ALL RESISTOR VALUES ARE IN OHMS
3. ALL CAPACITOR VALUES ARE IN FARADS
4. RESISTORS R21, R22, R27, R28, R29, R30 ARE METAL OXIDE 1/4W 1%.
5. C5, C15, C18, C21, C22, C23, C29, C33 ARE TANTALUM CAPACITORS.
6. Q1 AND Q2 ARE MATCHED
7. L1 IS 8 TURNS 30 AWG ON 180Ω, 1/4W RESISTOR



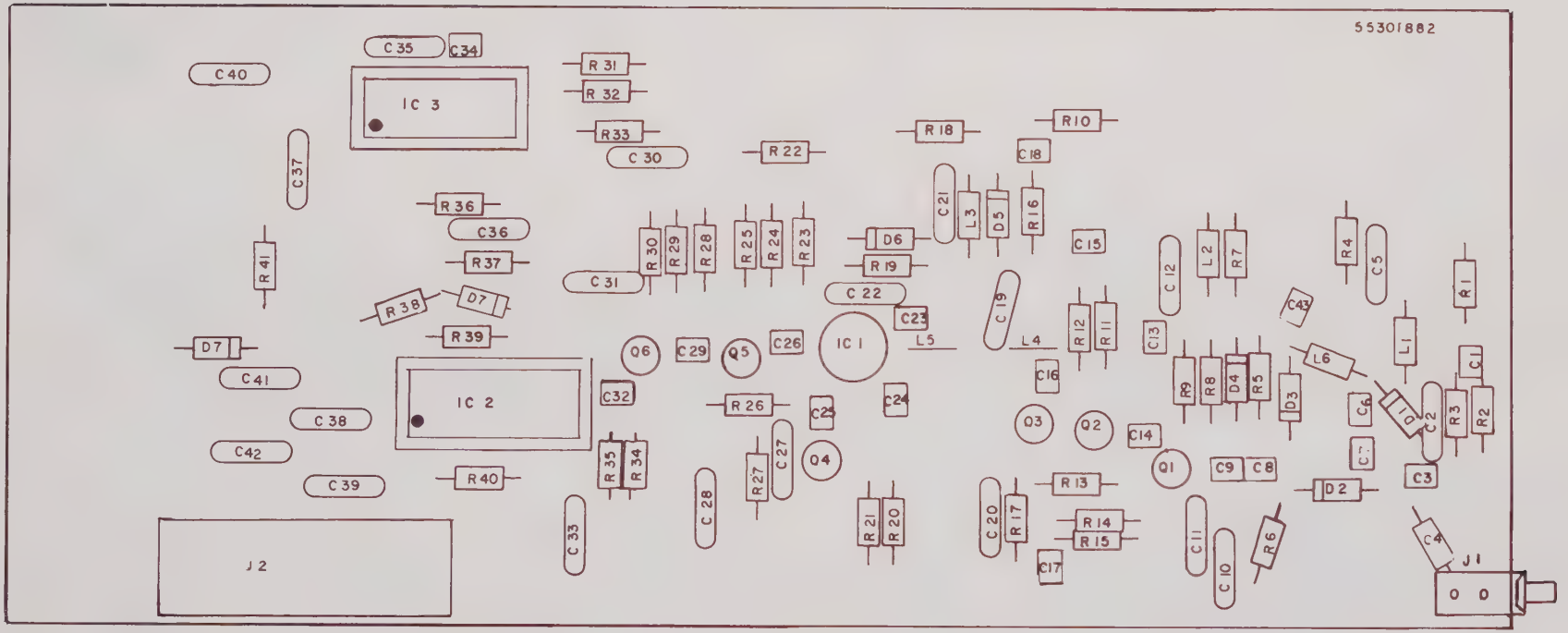
Material		DATE	SIGN
	Drawn	16 3 84	BEN-HUR
Finish	Eng	4 6 84	Z Rego
	Apprvl.	4 6 84	M Rez
Scale	MODEL		

Monsel ELECTRONIC INSTRUMENTS LTD.

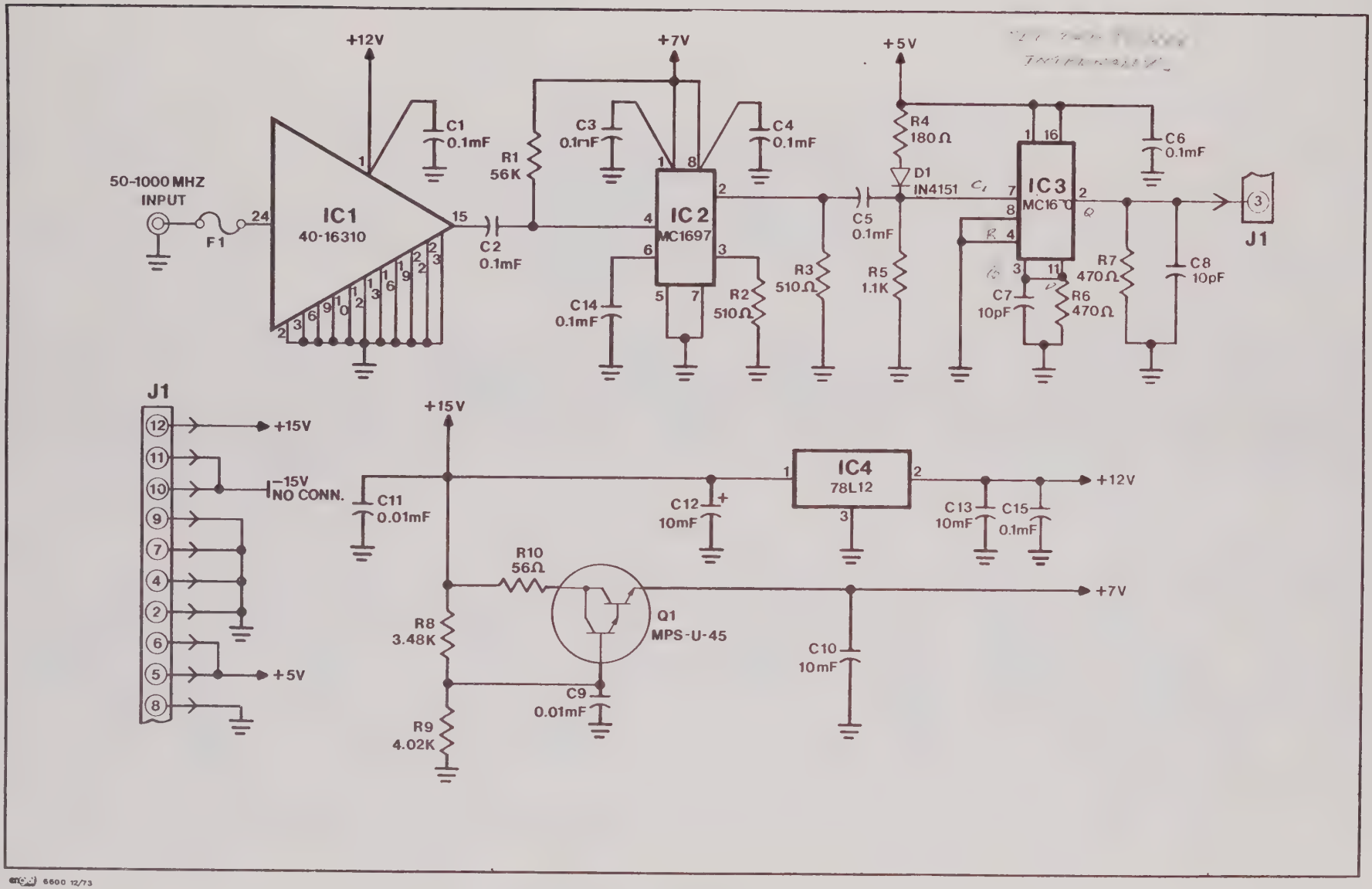
TITLE 150MHz INPUT BOARD

92301232

sht of 1

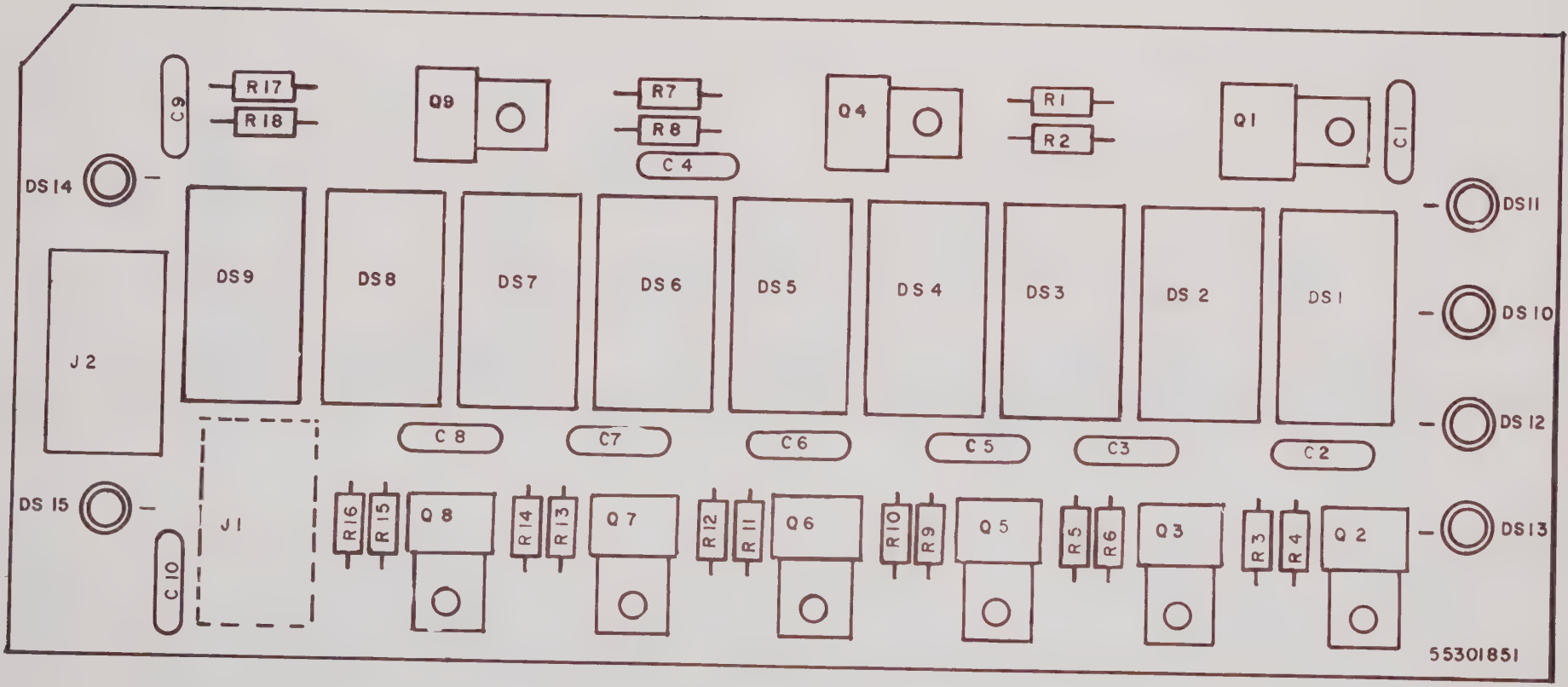


500 MHz INPUT BOARD
MODEL 8530,8730



6600 12/73

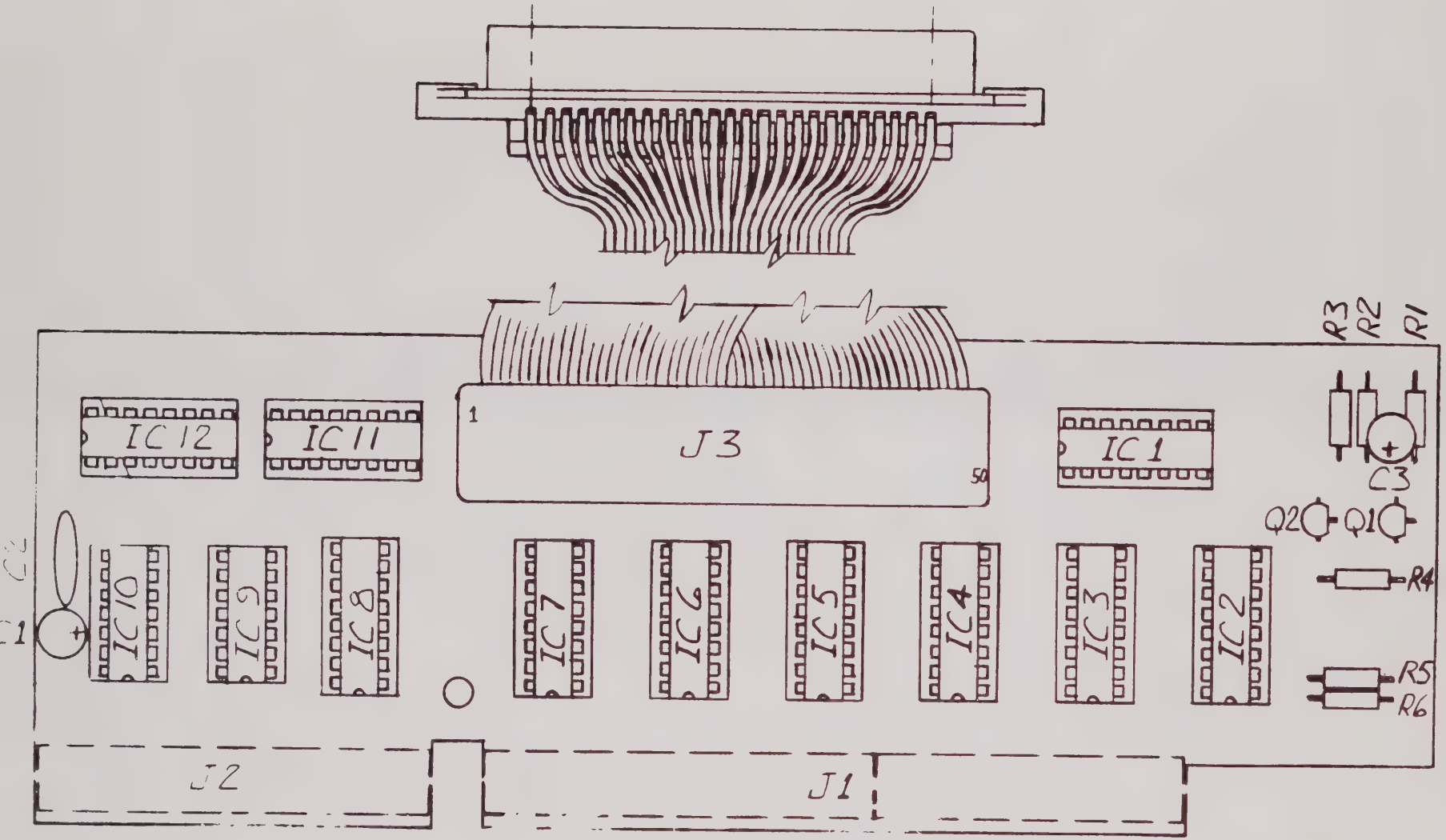
I GHz INPUT BOARD, SCHEMATIC



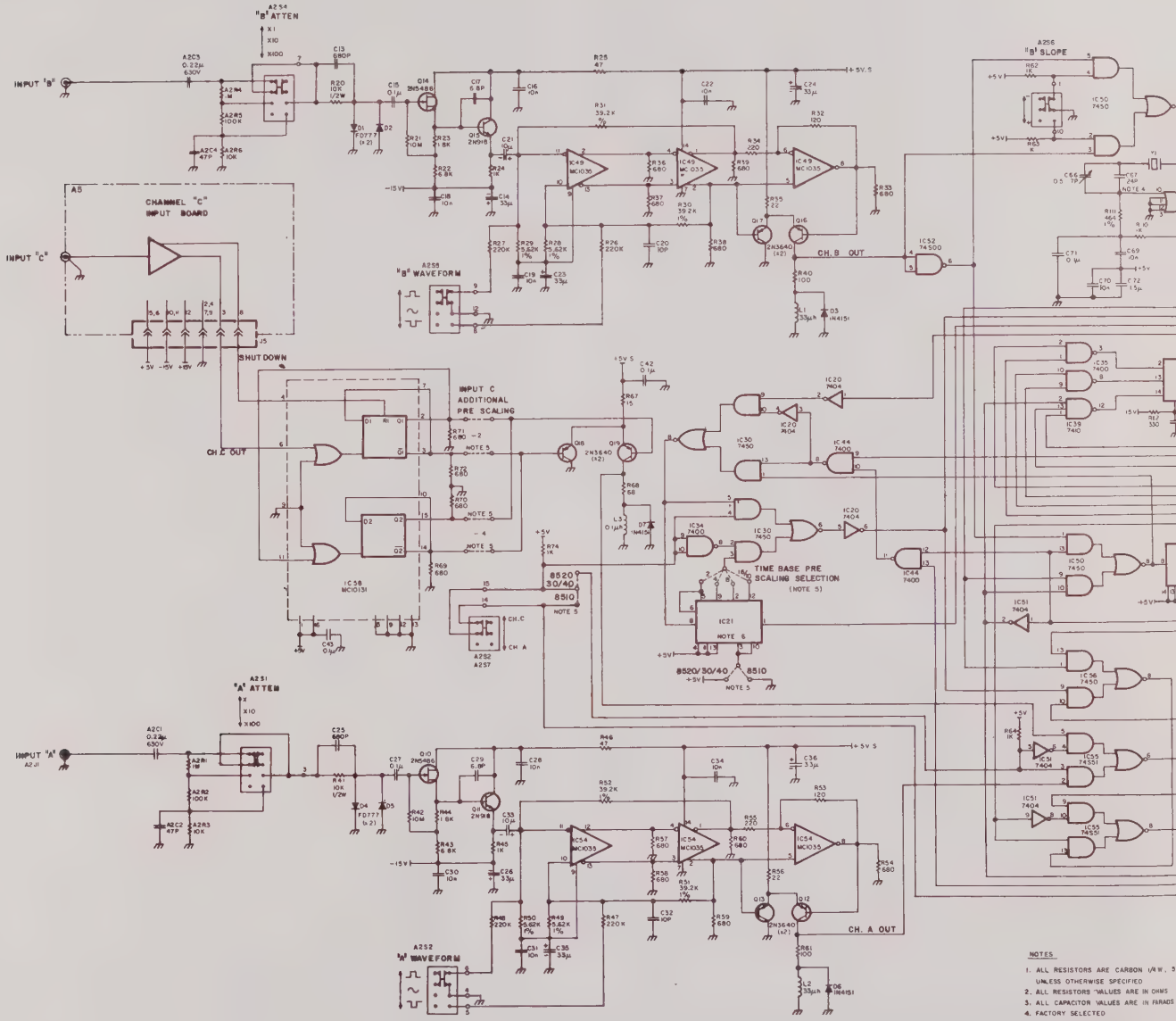
DISPLAY BOARD

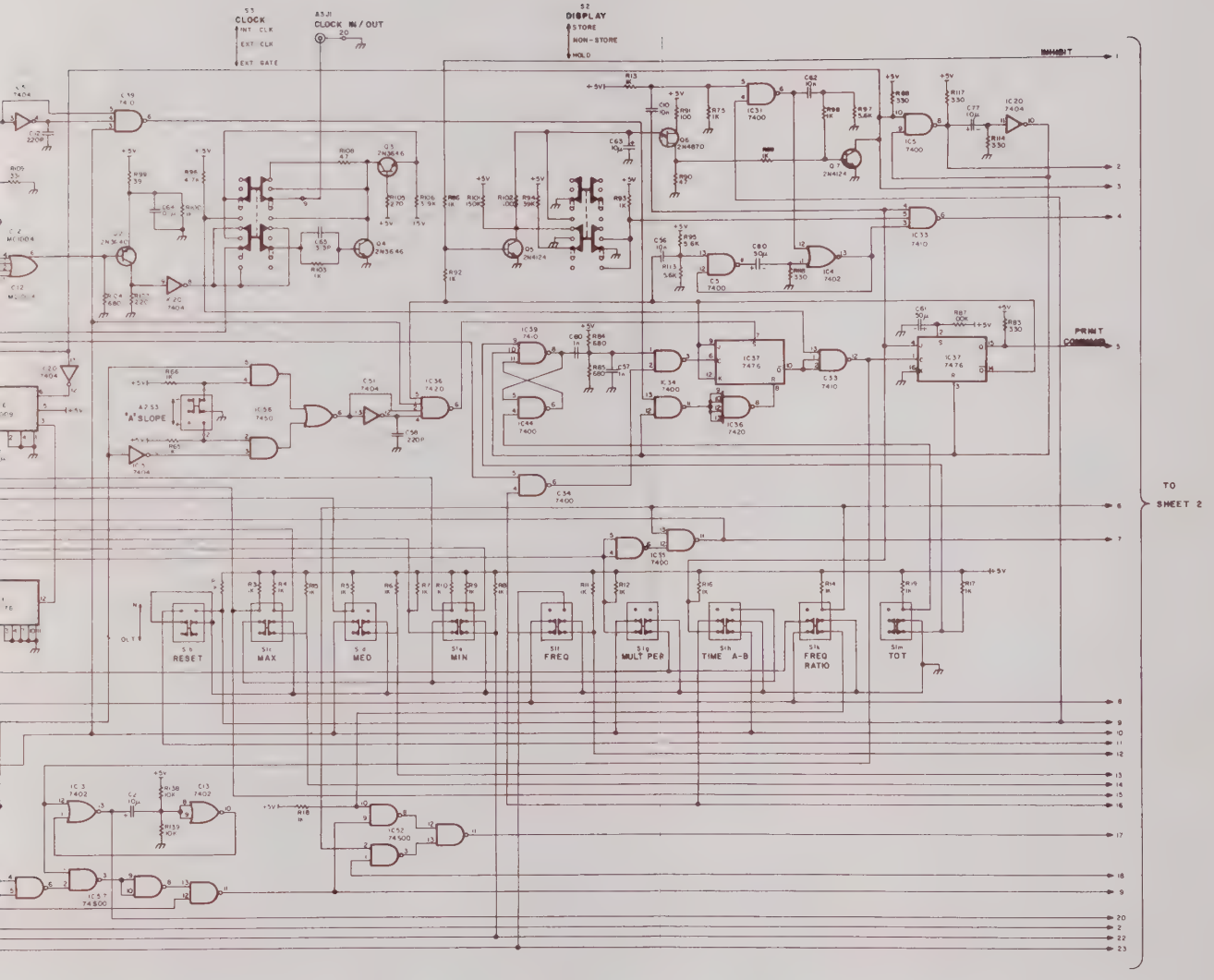
8500/8700

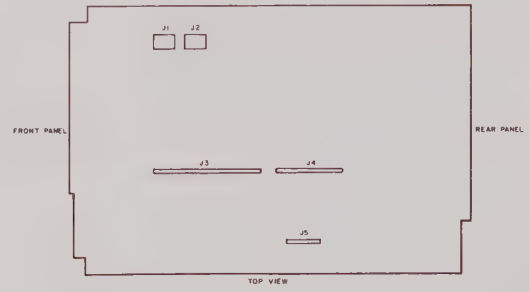
CAPACITORS USED ONLY ON 8500 SERIES.



BCD BOARD, COMPONENT LOCATION

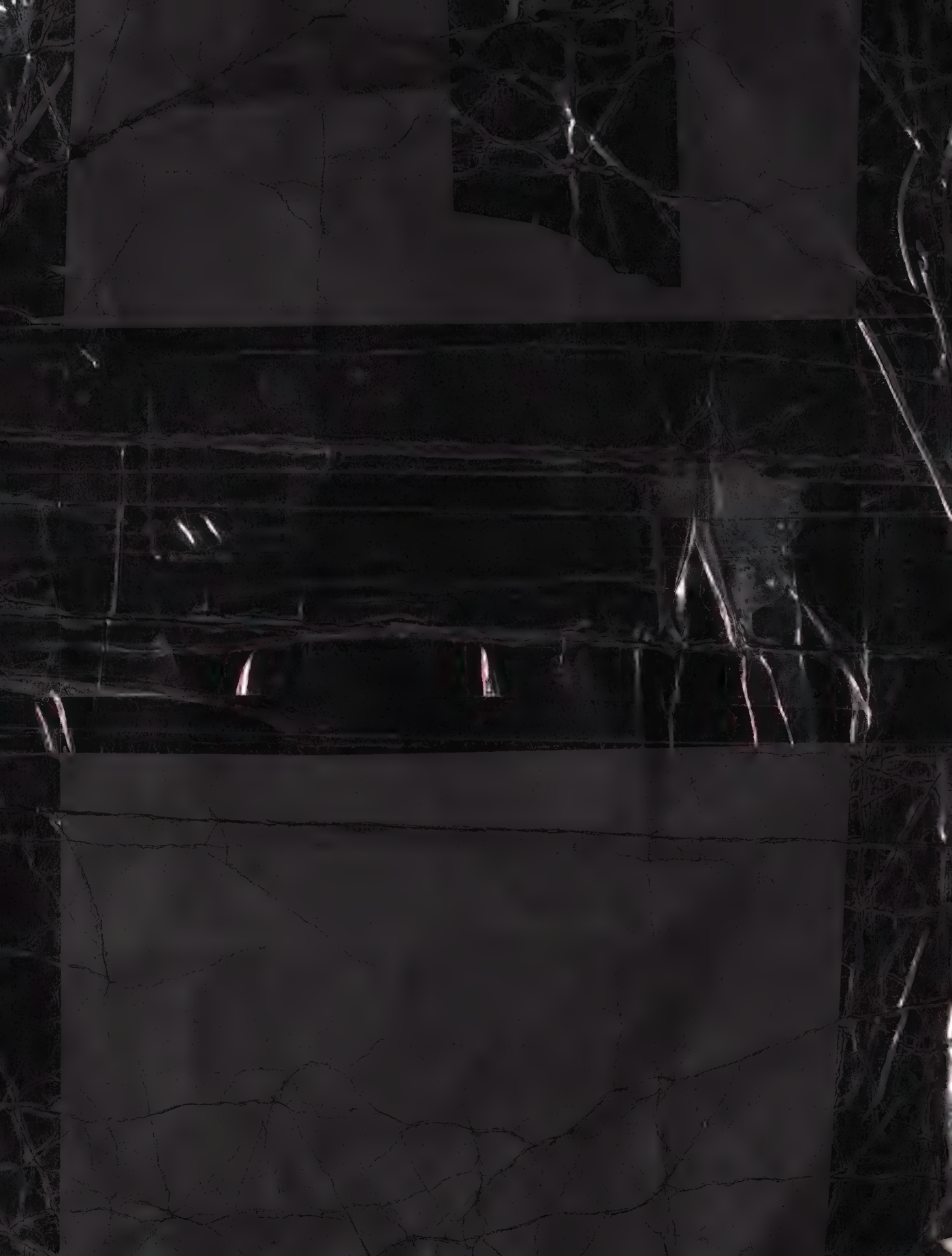

"B" ATTEN
INPUT "B"
CHANNEL "C" INPUT BOARD
INPUT "C"
SHUTDOWN
"B" WAVEFORM
CH. B OUT
"B" SLOPE
INPUT C ADDITIONAL PRE SCALING
CH. C OUT
TIME BASE PRE SCALING SELECTION
8520/30/40
8510
"A" ATTEN
INPUT "A"
"A" WAVEFORM
CH. A OUT
NOTES
1. ALL RESISTORS ARE CARBON 1/4W, 5
UNLESS OTHERWISE SPECIFIED
2. ALL RESISTORS VALUES ARE IN OHMS
3. ALL CAPACITOR VALUES ARE IN FARADS
4. FACTORY SELECTED
5. JUMPERS ON MAIN BOARD.
6. FOR MODEL 8510 IC21 = 74176
FOR MODEL 8520/30/40 IC21 = 7417
7. A 1 — MAIN BOARD
A 2 — FRONT PANEL
A 3 — REAR PANEL
A 4 — DISPLAY BOARD
A 5 — INPUT "C"

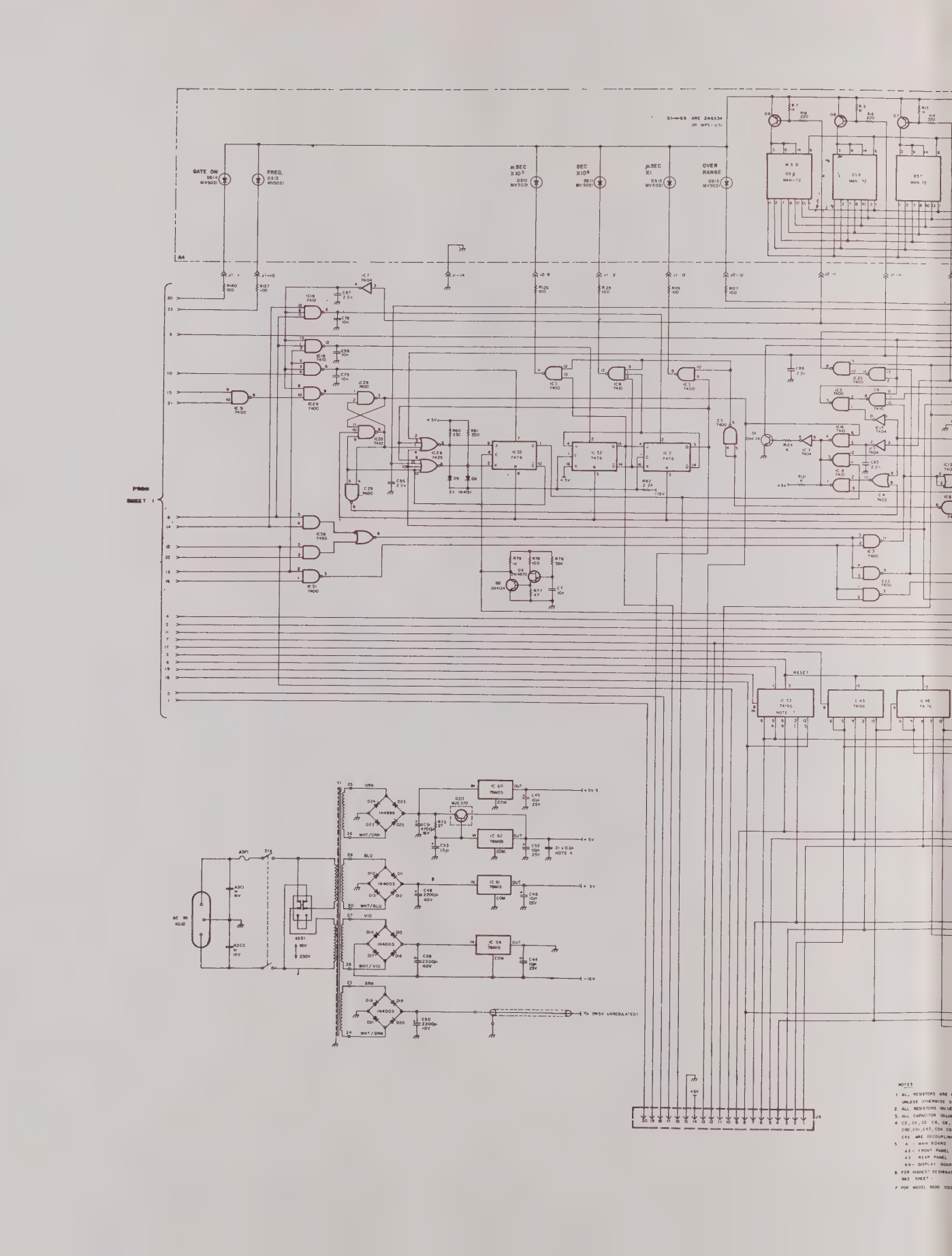


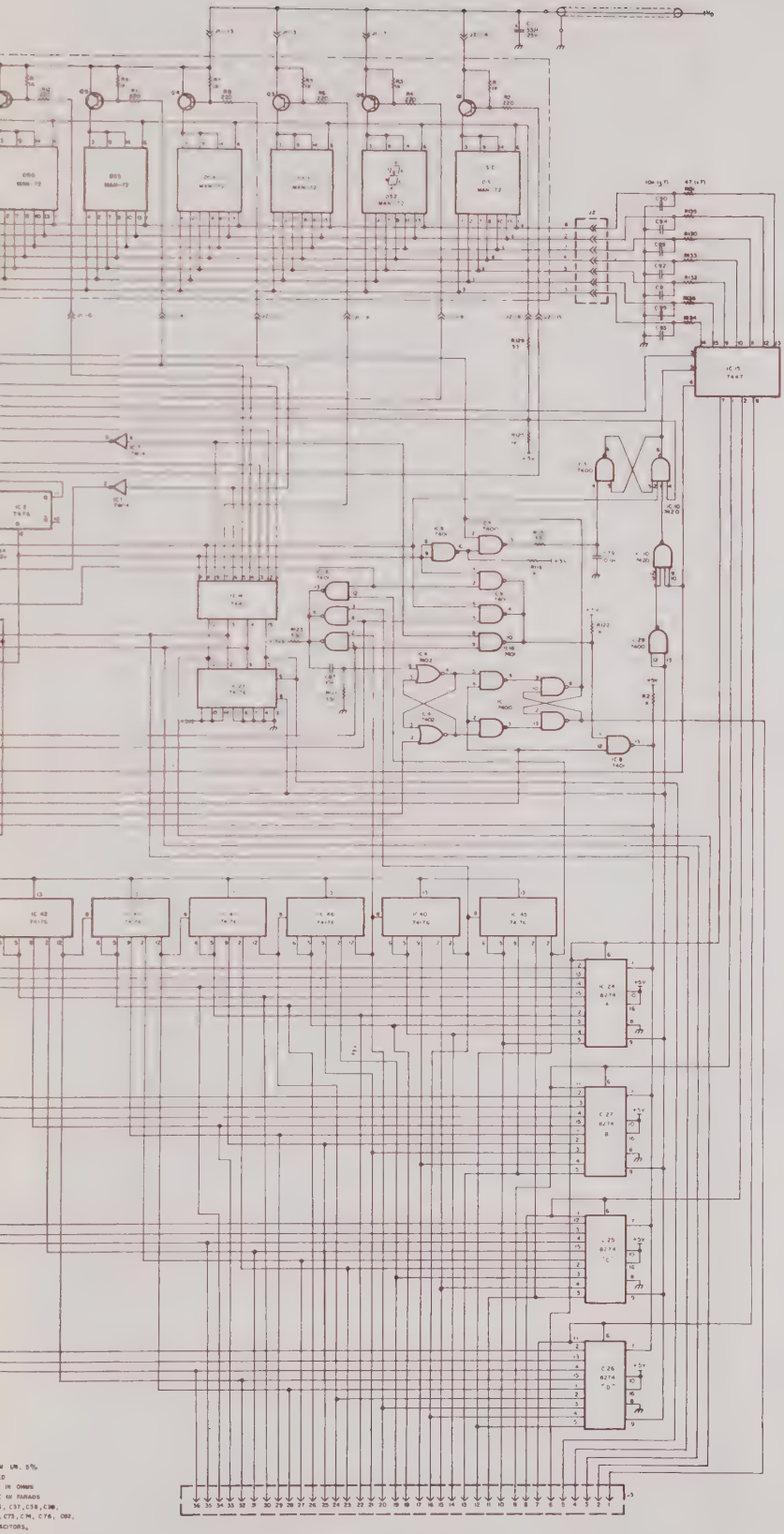


HIGHEST DESIGNATION USED					
IC62	Q20	D23	R140	C96	L3

		DATE	1968	Marconi ELECTRONIC INSTRUMENTS LTD.
Material	Drawn	4-9-74	BEN HUR	
Finish	Eng.			TITLE COUNTER / TIMER
Scale	Appvd.	9.9.74	TY Roz	
	MODEL 8540/20/30/40			Sht 1 of 2 92301251




GATE ON
FREQ.
mSEC X10³
SEC X10⁰
μSEC X1
OVER RANGE
Q1→Q9 ARE 2N6534 OR MPS-U51
RESET
AC IN
A3F1
S15
A3T1
115V
230V
+5V
-15V
NOTES

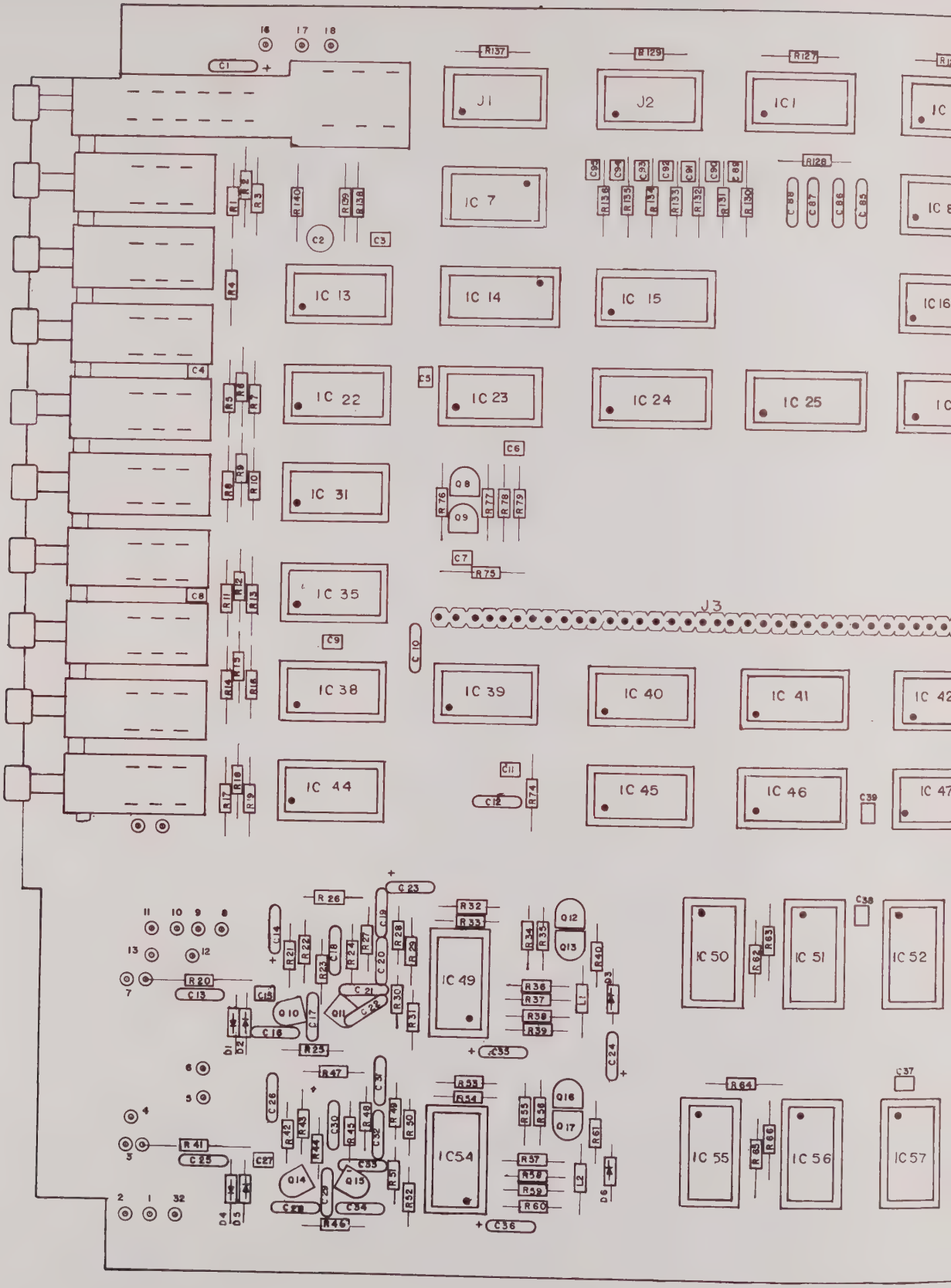


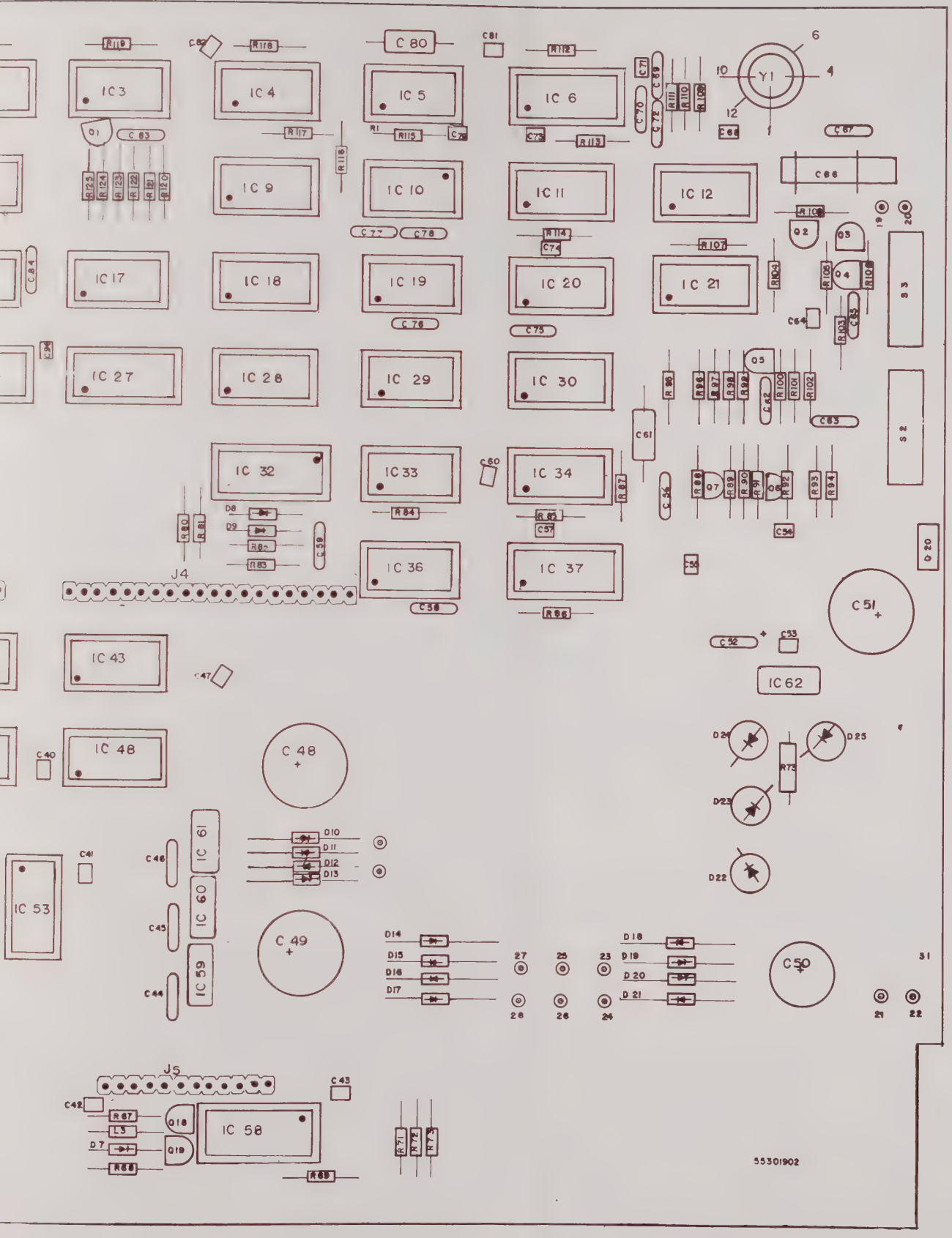
Material		DATE	STOD
Finish	Drawn	6-9-74	DCH HUR
Scale	Appvd.	9.9.74	
	MODEL 8510/20/30/40		

Monsel ELECTRONIC INSTRUMENTS LTD.

TITLE COUNTER/ TIMER

92301251


J1
J2
IC 1
IC 7
IC 13
IC 14
IC 15
IC 22
IC 23
IC 24
IC 25
IC 31
IC 35
IC 38
IC 39
IC 40
IC 41
IC 44
IC 45
IC 46
J3
IC 49
IC 50
IC 51
IC 52
IC54
IC 55
IC 56
IC 57



Material		DATE	SIGN	Monsel ELECTRONIC INSTRUMENTS LTD.
Finish	Drawn	20.9.74	ADELA	TITLE CLS COUNTER TIMER – MOTHER BOARD
Scale	Eng Apprl.	MODEL 8510/20/30/40		Sht 1 of 1 — 54303651

8500 Mother Board

Ref. Des.	Description	Stock Number
C1, 14, 23, 24, 26, 35, 36	Capacitor, 33mF @ 25V	07002170
C2, 21, 33, 44, 45, 46, 52, 63, 77	Capacitor, 10mF @ 25V	07027130
C3, 4, 5, 6, 8, 9, 11, 15, 27, 37, 38, 39, 40, 41, 42, 43, 47, 54, 55, 64, 68, 71, 73, 74, 76, 79, 81, 82, 96	Capacitor, 100mF @ 100V	07038390
C7, 10, 16, 18, 19, 22, 28, 31, 34, 59, 62, 69, 70, 75, 78, 83	Capacitor, 10mF @ 16V	07038780
C12, 58	Capacitor, 220pF	07038580
C13, 25	Capacitor, 680pF	07038600
C17, 29	Capacitor, 6.8pF	07038520
C20, 32	Capacitor, 10pF	07038510
C30	Capacitor, 10mF @ 6.3V	07125160
C48, 49	Capacitor, 2200mF @ 40V	07026400
C50	Capacitor, 2200mF @ 10V	07026370
C51	Capacitor, 4700mF @ 16V	07026460
C53, 72	Capacitor, 1.5mF	07002130
C56, 57, 89, 90-97	Capacitor, 10mF @ 1000V	07125440
C61, 80	Capacitor, 50mF @ 6.4V	07026220
C65	Capacitor, 3.3pF	07038500
C66	Capacitor, Trimmer, 0.5-7pF	07065100
C84-88	Capacitor, 0.0022mF @ 16V	07038750

Ref. Des.	Description	Stock Number
D1, 2, 4, 5	Diode, FD777	05005040
D3, 6, 7, 8, 9	Diode, IN4151	05027010
D10-21	Diode, IN4003	05020080
D22-25	Diode, IN4999	05022650
IC1, 3, 5, 22, 29, 31, 34, 35, 44	Integrated Circuit, MC7400, 4X2 Input	24001410
IC2, 32, 37	Integrated Circuit, 7476, Dual J-K Flip-Flop	24020760
IC4, 13	Integrated Circuit, 7402, Quad Nor	24020020
IC6	Integrated Circuit,Mos MK5009, Time Base Divider	24024500
IC7, 17, 20, 51	Integrated Circuit, SN7404N, Hex Inverter	24020040
IC8, 19, 33, 39	Integrated Circuit, N7410, 3X3 Input Nand	24024050
IC9, 16, 18	Integrated Circuit, MC7401P, Quad 2 Input Pos. Gate	24024010
IC10, 36	Integrated Circuit, 7420, 2-4 Input Nand	24020290
IC11, 21 (Model 8510 Only), 23, 40, 41, 42, 45, 46, 47, 48	Integrated Circuit, 74176, Decade	24024650
IC12	Integrated Circuit, MC1004, Dual 4 Input Nor	24024560
IC14	Integrated Circuit, MC7442P, BCD to 10 Line Decoder	24024520
IC15	Integrated Circuit, MC7447, BCD to 7 Segment	24020470
IC21 (Models 8520 and 8530 Only)	Integrated Circuit, 74177	24024660

Ref. Des.	Description	Stock Number
IC24, 25, 26, 27	Integrated Circuit, 8274, 10 bit shift register	24024530
IC28	Integrated Circuit, 7425, Dual 4 Input Nor	24024260
IC30, 38, 50, 56	Integrated Circuit, MC7450, and, Nor	24024130
IC43, 53 (Models 8510 and 8520 Only)	Integrated Circuit, 74196, 50 MHz Decade	24024120
IC49, 54	Integrated Circuit, MC1035L	24024010
IC52, 57	Integrated Circuit, 74500	24024080
IC53 (Model 8530 Only)	Integrated Circuit, 82590	24024780
IC55	Integrated Circuit, 74S51, High Speed	24024770
IC58 (Model 8520 Only)	Integrated Circuit, MC10131 Selected	24024350
L1, 2	Inductor, 27 Microhenry	03000190
L3	Inductor, 0.1 Microhenry	03000500
Q1, 5, 7, 8	Transistor, 2N4124	10001290
Q2, 12, 13, 16, 17, 18, 19	Transistor, MPS3640	10000010
Q3, 4	Transistor, MPS3646	10000620
Q6, 9	Transistor, 2N4870	10001490
Q10, 14	Transistor, 2N5486	10002360
Q11, 15	Transistor, 2N918	10000700
R1-19, 24, 45, 62-66, 74, 75, 79, 86, 89, 92, 93, 98, 100, 103, 110, 116, 125, 134	Resistor, 1K, 1/4W, 5%	13433000
R8, 25, 46, 77, 90, 130-136	Resistor, 47 Ohm, 1/4W, 5%	13431650

Ref. Des.	Description	Stock Number
R20, 138, 139	Resistor, 10K, 1/4W, 5%	13434000
R21, 42	Resistor, 10 Meg Ohm, 1/4W, 5%	13437000
R22, 43	Resistor, 6.8K, 1/4W, 5%	13433800
R23	Resistor, 1.8K, 1/4W, 5%	13433240
R26, 27, 47, 48	Resistor, 220K, 1/4W, 5%	13435330
R28, 29, 49, 50	Resistor, 5.62K, 1/4W, 1%	13023720
R30, 31, 51, 52	Resistor, 39.2K, 1%, 1/4W	13024570
R32, 34, 55	Resistor, 220 Ohm, 1/4W, 1%	13432330
R33, 36, 37, 38, 39, 54, 57, 58, 59, 60, 70, 71, 72, 84, 85, 104	Resistor, 680 Ohm, 1/4W, 5%	13432800
R35, 56	Resistor, 22 Ohm, 1/4W, 5%	13431330
R40, 61, 78, 91, 102, 119, 126, 127, 128, 137, 140	Resistor, 100 Ohm, 1/4W, 5%	13432000
R41	Resistor, 10K, 1/2W, 5%	13454000
R53	Resistor, 120 Ohm, 1/4W, 5%	13432080
R67	Resistor, 15 Ohm, 1/4W, 5%	13431170
R68	Resistor, 68 Ohm, 1/4W, 5%	13431800
R73	Resistor, 27 Ohm, 1/2W, 5%	13451410
R76, 95, 97, 113	Resistor, 5.6K, 1/4W, 5%	13433720
R82	Resistor, 2.2K, 1/4W, 5%	13433330
R86	Resistor, 100K, 1/4W, 5%	13435000
R94	Resistor, 39K, 1/4W, 5%	13434570
R96	Resistor, 4.7K, 1/4W, 5%	13433650
R99	Resistor, 39 Ohm, 1/4W, 5%	13431570
R101	Resistor, 150K, 1/4W, 5%	13435170

Ref. Des.	Description	Stock Number
R105, 107	Resistor, 270 Ohm, 1/4W, 5%	13432410
R108	Resistor, 27 Ohm, 1/4W, 5%	13431410
R111	Resistor, 47 Ohm, 1/4W, 1%	13021650
R129	Resistor, 33 Ohm, 1/4W, 5%	13431500
S1	Switch, Push	25000430
S2, 3	Switch, 4P3T	25003080
Y1	Crystal, 10MHz	04000200
	Complete Assembly	89301861

8500 SERIES

Miscellaneous Parts

Ref. Des.	Description	Stock Number
	Front Panel	
	Switch, 115/230	25005080
SW1, 2, 4, 5	Switch, DP3T	25005010
SW3, 6	Switch, DPDT	25005040
C1, 3	Capacitor, 220mF @630V	07027150
C2, 4	Capacitor, 47pF	07038540
R1, 4	Resistor, 1 Meg Ohm, 1/4W, 5%	13436000
R2, 5	Resistor, 100K, 1/4W, 5%	13435000
R3, 6	Resistor, 10K, 1/4W, 5%	13434000
	Rear Panel	
A3C1, A3C2	Capacitor, 1mF, 1KV	07038160
F1	Fuse, 0.25A, Slo-Blo	19004010
T1	Transformer	
	Core	03300362
	Coil	46000170

8500 SERIES

Display Board

Ref. Des.	Description	Stock Number
C1-9	Capacitor, 680pF	07038600
C10	Capacitor, 10mF	07038780
DS1-9	Readout, MAN-72	21005270
DS10-15	Indicator, MV5021	16000990
Q1-9	Transistor, MPS 6534	10000710
R1, 3, 5, 7, 9, 11, 13, 15, 17	Resistor, 1K Ohm, 1/4W, 5%	13433000
R2, 4, 6, 8, 10, 12, 14, 16, 18	Resistor, 220 Ohm, 1/4W, 5%	13432330
	Complete Assembly	89301871

BCD BOARD - Option 011

Ref. Des.	Description	Stock Number
C1	Capacitor, 10mF	07001860
C2	Capacitor, 22mF	07038790
IC1-8	Integrated Circuit, MM80C95	24024800
IC9	Integrated Circuit, 7400	24001410
IC10	Integrated Circuit, 7402	24020020
IC11, 12	Integrated Circuit, 7475	24001620
	Complete Assembly	92301323

150 MHz INPUT BOARD

REF. DES.	DESCRIPTION	STOCK NUMBER
C1	Capacitor, 0.22 mF	07028150
C2	Capacitor, 47 pF	07038540
C3	Capacitor, 680 pF	07038600
C4,7,9,12,14,17, 24,25,27,30	Capacitor, 0.01 mF	07033780
C5,18,22,29	Capacitor, 33 mF	07002170
C6,8	Capacitor, 220 pF	07038580
C10,13,18,19,20,34,35	Capacitor, 0.22 mF	07038790
C11	Capacitor, 10 pF	07038510
C16	Capacitor, 330 pF	07038610
C21	Capacitor, 120 mF	07004120
C23	Capacitor, 10 mF	07001860
C26	Capacitor, 6.8 pF	07038520
C31	Capacitor, 3.3 pF	07038500
C33	Capacitor, 270 mF	07004270
D1,2	Diode, FD777	05005040
D3,4,5	Diode, 1N4151	05027010
D6	Diode, 1N750A	05015500
F1	Fuse, Littlefuse, 273.062 (Option 082 Only)	52-16195
IC1	Integrated Circuit, Motorola MC1550	24024550
IC2	Integrated Circuit, Motorola MC1437	24000830
IC3	Integrated Circuit, Motorola MC10116	24024320
Q1,2	Transistor, Matched Pair	10300031
Q3,4	Transistor, MPS918	10000050
Q5	Transistor, 2N2369	10050100
R1	Resistor, 10K, 1/4W, 5%	13434000
R2	Resistor, 1 meg, 1/4W, 5%	13436000
R3	Resistor, 10K, 1/2W, 5%	13454000
R4,5	Resistor, 100 ohm, 1/2W, 5%	13452000
R6	Resistor, 12K, 1/4W, 5%	13434080
R7,16,17	Resistor, 1K, 1/4W, 5%	13433000
R8	Resistor, 47K, 1/4W, 5%	13434650
R9	Resistor, 56 ohm, 1/4W, 5%	13431720
R10	Resistor, 270 ohm, 1/4W, 5%	13432410
R11	Resistor, 82 ohm, 1/4W, 5%	13431880
R12	Resistor, 910 ohm, 1/4W, 5%	13432920
R13,14	Resistor, 1.5K, 1/4W, 5%	13433170
R15,19,20	Resistor, 470K, 1/4W, 5%	13435650
R18,33,36	Resistor, 470 ohm, 1/4W, 5%	13432650
R21,22	Resistor, 5.62K, 1/4W, 1%	13023720
R23,24,25,26,31,38	Resistor, 560 ohm, 1/4W, 5%	13432120
R27	Resistor, 174 ohm, 1/4W, 1%	13022230

REF. DES.	DESCRIPTION	STOCK NUMBER
R28	Resistor, 221 ohm, 1/4W, 1%	13022330
R29	Resistor, 392K, 1/4W, 1%	13024570
R32	Resistor, 100 ohm, 1/4W, 5%	13432000
R34	Resistor, 27K, 1/4W, 5%	13434410
R35	Thermistor, 1K, 10%	27000660
R37	Resistor, Trimmer, 200 ohm, 1W, 10%	09002510
R39,40	Resistor, 120K, 1/4W, 5%	13435080
S1	Switch, Slide	25003080
	Complete Assembly	89301901

500 MHz INPUT BOARD (serial numbers up to 610)
For serial numbers above 610

REF. DES.	DESCRIPTION	STOCK NUMBER
C1,3,6,7,8,9,13,14,16, 17,23,24,25,26,34	Capacitor, 0.1 mF	01038390
C2	Capacitor, 3.3 pF	07038500
C4	Capacitor, 0.1 mF	07010030
C5,15,31,33,38,40,41	Capacitor, 0.01 mF	07038780
C10,21	Capacitor, 0.022 mF	07038790
C11	Capacitor, 8.2 pF	07030310
C12,22,27	Capacitor, 150 pF	07038570
C15,32	Capacitor, 0.01 mF	07125440
C18	Capacitor, 0.1 mF	07125430
C19,35,37	Capacitor, 22 pF	07038530
C20	Capacitor, 15 pF	07030230
C28,39,42	Capacitor, 33 mF	07002170
C30,36	Capacitor, 560 pF	07036640
CR1,2,3	Diode, HP 5082-3080	05124040
CR4	Diode, 1N4151	05027010
CR5	Diode, Hot Carrier, HP 5082-2800	05027480
CR6	Diode, 1N751A	05015050
CR7	Diode, 1N750	05015500
L1	Inductor, 0.33 μH	03000560
L2,3	Inductor, 22 μH	03000780
ML1	Integrated Circuit, Special Selected	24300001
ML2	Integrated Circuit, Motorola MC1670L	24001670
ML3	Integrated Circuit, Motorola MC1437	24000830
Q1,2,3	Transistor, K2071	10050020
Q4,5,6	Transistor, 2N5179	10001400
R1,15,21,25	Resistor, 1.2K, 1/4W, 5%	13433080
R2	Resistor, 1.8K, 1/4W, 5%	13433240
R3	Resistor, 6.8K, 1/4W, 5%	13433800
R4	Resistor, 910 ohm, 1/4W, 5%	13432920
R5	Resistor, 39 ohms, 1/4W, 5%	13431570
R6,13,23,26,33,36	Resistor, 1.5K, 1/4W, 5%	13433170
R7,8,24	Resistor, 2.7K, 1/4W, 5%	13433410
R9,11	Resistor, 390 ohms, 1/4W, 5%	13432570
R10	Resistor, 100K, 1/4W, 5%	13435000
R12,37	Resistor, 2.2K, 1/4W, 5%	13433330
R14	Resistor, 82 ohm, 1/4W, 5%	13431880
R16	Resistor, 3.3K, 1/4W, 5%	13433500
R17	Resistor, 56 ohm, 1/4W, 5%	13431820
R18	Resistor, 1K, 1/4W, 5%	13433000
R19,28	Resistor, 330 ohms, 1/4W, 5%	13432500
R22	Resistor, 120 ohm, 1/4W, 5%	13432080
R27	Resistor, 820 ohm, 1/4W, 5%	13432880

REF. DES.	DESCRIPTION	STOCK NUMBER
R29,30	Resistor, 3.9K, 1/4W, 5%	13433570
R31	Resistor, 137 ohm, 1/4W, 1%	13022130
R32	Resistor, 6.81K, 1/4W, 1%	13023800
R34,39,40	Resistor, 470 ohm, 1/4W, 5%	13432650
R38	Resistor, 332 ohm, 1/4W, 1%	13022500
R41	Resistor, 560 ohm, 1/4W, 5%	13432720
	Complete Assembly	89301841

500MHz Input Board for Serial Numbers above 610

Parts are the same as used with the 1GHz Board, except the following components have been deleted:

C6, 7, and 8; R6 and 7; IC3

SCHEMATIC for this input board will be identical to the 1GHz schematic, Figure 16, except C6, 7, and 8; R6 and 7; and IC3 have been deleted. A jumper has been installed between the junction of D1/R5 and the output connector J1, Pin 3.

COMPONENT LOCATION drawing for this input board will be identical to the 1GHz component drawing, Figure 15, except C6, 7, and 8; R6 and 7; and IC3 have been deleted.

PARTS LIST, 1 GHz BOARD

REF. DES.	DESCRIPTION	STOCK NUMBER
C1-6, 14, 15	Capacitor, Chip, 0.1mF	56-16706D104TZ100
C7,8	Capacitor, Ceramic, 10pF @ 1000V	56-10215A100KT10
C9,11	Capacitor Ceramic, 0.01mF @ 500V	56-10215C103KTR5
C10,12,13	Capacitor, Tantalum, 10mF @ 20V	56-12731F106N20
D1	Diode, IN4151	05027010
F1	Fuse, Option. 082	52-16195
IC1	Integrated Circuit, Op-Amp, Optimax CA-1041	40-16310
IC2	Integrated Circuit, MC1697	40-16311
IC3	Integrated Circuit, MC1670	40-15695
IC4	Integrated Circuit, Voltage Regulator, 78L12	40-15325
Q1	Transistor, MP5U-45	40-16399
R1	Resistor, Carbon 100K, 1/8W, 5%	55-15729HK100
R2,3	Resistor, Carbon, 510 ohm, 1/4W, 5%	55-10101HA510
R4	Resistor, Carbon, 180 ohm, 1/4W, 5%	55-10101HA180
R5	Resistor, Carbon, 1.2K, 1/4W, 5%	55-10101HK001R2
R6,7	Resistor, Carbon, 470 ohm, 1/4W, 5%	55-10101HA470
R8	Resistor, Film, 3.48K, 1/2W, 1%	55-10111ELK003R48
R9	Resistor, Film, 4.53K, 1/2W, 1%	55-10111ELK004R53
R10	Reistor, Carbon, 56 ohm, 1/2W, 5%	55-10102HA056
	Grounding Clip	5630031
	Complete Assembly, 1 GHz	05-16377-01
	Complete Assembly, 500 MHz	05-16377-02
	Specify (082) for High Input Overload Protection	

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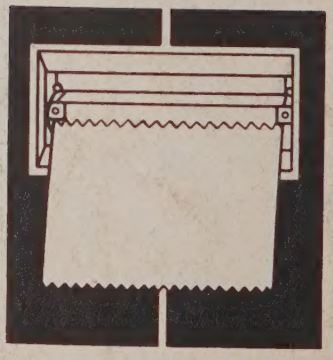

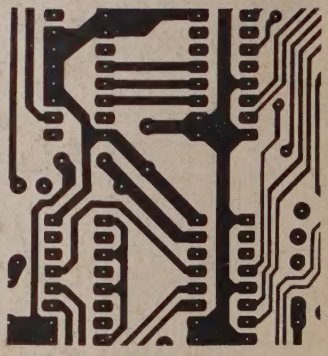

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